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# Riparian Community Classification for the Centennial Mountains and South Fork Salmon River Idaho

1983
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INTRODUCTION

This document reports work performed under Contract Number 53-84M8-2-0048 with the U.S. Forest Service (USFS), Region IV. This investigation is one of a series of studies intended to create a riparian community classification system for the Intermountain Region. Previous years have included work in the Greys River Basin (Norton etal., 1980 and 1981) and Wyoming Range (Mutz and Graham, 1982) of Wyoming, the Upper and Middle Fork of the Salmon River, Idaho (Tuhy and Jensen, 1982) and the North Slope of the Uinta Mountains of Utah (U.S.F.S., unpublished). In the project's fourth year, this study expands and refines work begun on the Salmon River and investigates the riparian system of the Centennial Mountains of Idaho.

The purpose of this project was not to "re-invent the wheel" but to complement work already done on the region's riparian systems. Criteria for choosing study sites and sampling and data analysis procedures were chosen to accomplish this goal and are described below.

Three areas were originally considered for intensive study (Figure 1):

1) South Fork of the Salmon River, including Johnson Creek and tributaries

2) Centennial Mountains

3) Palisades Reservoir

After reconnaissance of all three areas the field team decided, in conjunction with the Forest Service, to confine sampling to the first two areas.

Plots were established in the South Fork area in order to complete work begun the previous year. Reconnaissance of the area in 1981 (Tuhy and Jensen, 1982) indicated that much of the South Fork riparian vegetation could be defined in terms of community types established on the Middle Fork and Upper Salmon Rivers. Tuhy and Jensen suggested the possibility of a new alder type but recommended limited sampling. The goal of sampling in this area was to define the new alder type, if appropriate, and to validate the Tuhy and Jensen Salmon River classification system. The latter involved sampling a limited number of stands which appeared to fit into the Salmon River classification system. Some of these community types (cts) were split into two or more new types in recognition of floristic differences and distinct management requirements.

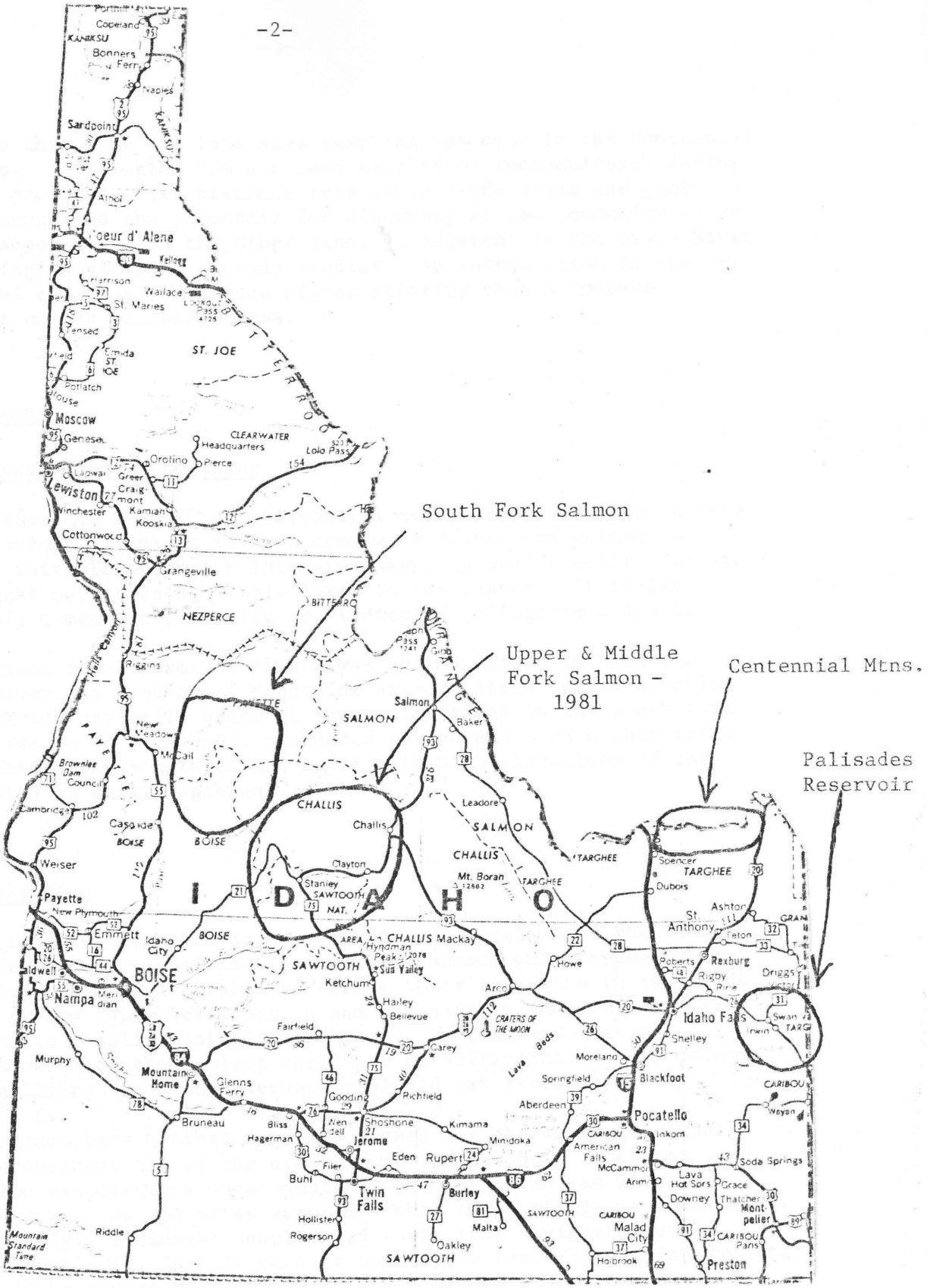


Figure 1. Three Potential Study Areas and 1981 Salmon Study Area

About two thirds of the intensive sampling was done in the Centennial Mountains. This region had not been sampled or reconnoitered during previous projects. Its distance from other study areas and geologic history suggested the potential for discovery of new community types. The Palisades area, on the other hand, is adjacent to the Greys River and Wyoming Range areas already studied. An introduction to the new Centennial area was considered higher priority than a "mop-up" operation on the Palisades area.

## FIELD METHODS

### Reconnaissance and Scheduling

A reconnaissance of all three potential study areas was made in late June. Various drainages in each area were driven and walked to identify suitable areas for intensive sampling and to collect plants which might not be recognizable later in the season. Drainages ultimately chosen for sampling are indicated in Figures 2 and 3.

Phenological development of plants was behind normal in both the Salmon River and Centennial Mountains areas. Actual field sampling of vegetation and soils began at lower elevations in the South Fork Salmon area on July 8, 1982, proceeded to low and then higher areas of the Centennial Mountains and ended with high elevations of the Salmon area in early September.

### Stand Selection

Initial sampling began in each area with verification of the Tuhy and Jensen (1982) classification system. Stands which appeared to "fit" the system were sampled to verify their occurence in the study areas. As new types were located and intensively sampled, less time was given to sampling established types. We realized that the 150 sites required of the project would not be sufficient to both document all established types and adequately sample new types.

Sample stands were neither randomly chosen nor chosen to represent only the dominant cts of the area. Even infrequently repeating vegetation associations were sampled. Each drainage was given a letter designation and sites sampled within the drainage were numbered consecutively. Drainages sampled and their code designations are listed in Table 1. Ideally each ct already defined for the Intermountain area would be represented by two or three sample sites in the study area while new types would be represented by at least 5 sites.

Table 1. Abbreviations for Sample Drainages

CENTENNIAL MOUNTAINS

| | |
|---|---|
| BC | Blind Creek |
| BT | Bear Trap Creek |
| COT | Cottonwood Creek |
| DR | Dry Canyon |
| H | Howard Creek |
| KC | Kay Creek |
| MC | Miners Creek |
| S | Steel Creek |
| SAL | Salamander Creek Area |
| STM | Stamp Meadow |
| T | Taylor Creek |
| TR | Trail Creek |
| WC | West Camas Creek |
| WDR | West Dry Creek |
| WF | Waters Flat |
| WI | Willow Creek |

SOUTH FORK SALMON RIVER AREA

| | |
|---|---|
| DC | Dollar Creek |
| DW | Deadwood Creek |
| JC | Johnson Creek |
| SFS | South Fork Salmon River (includes Stolle Meadows) |
| TM | Tyndall Meadows |
| WL | Warm Lake Vicinity |

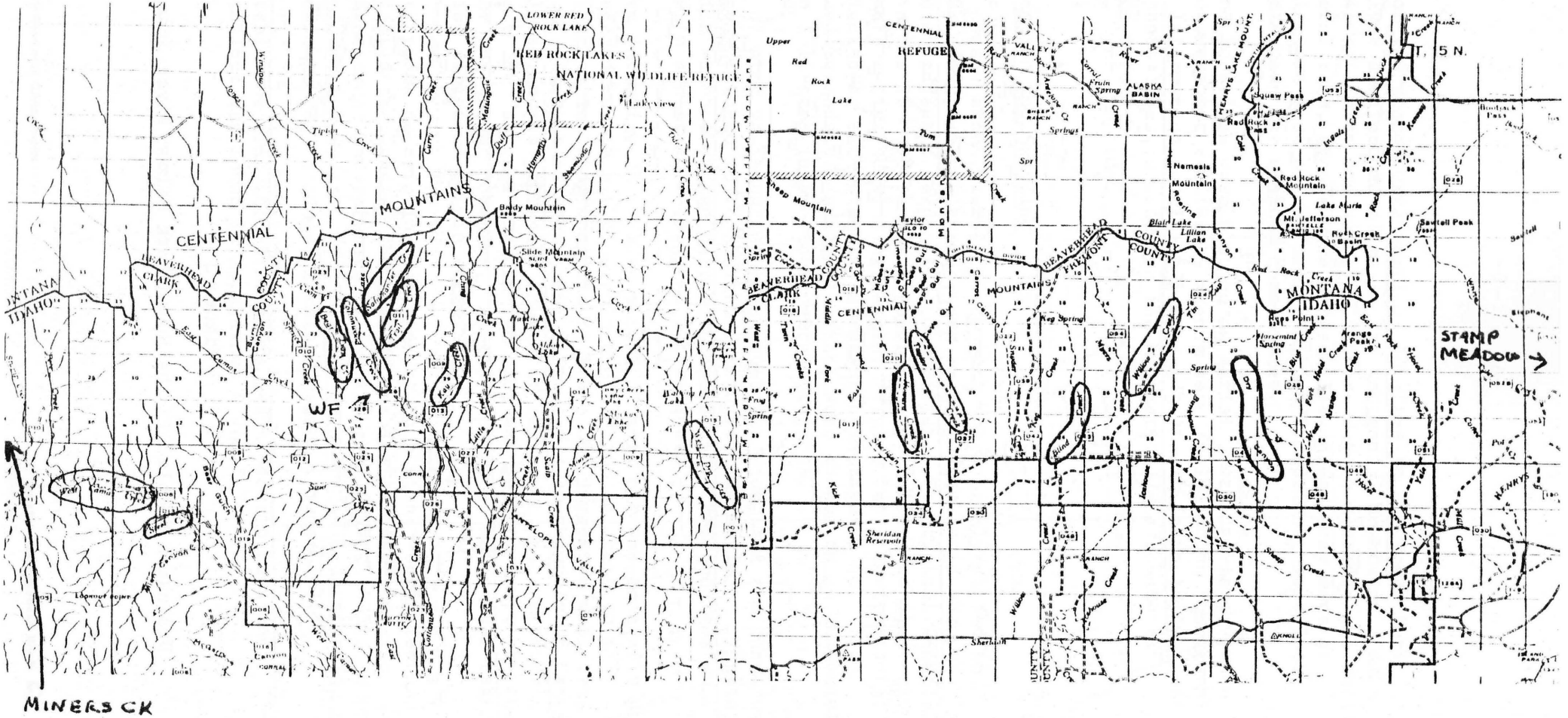


Figure 2. Drainages Sampled in the Centennial Mountains

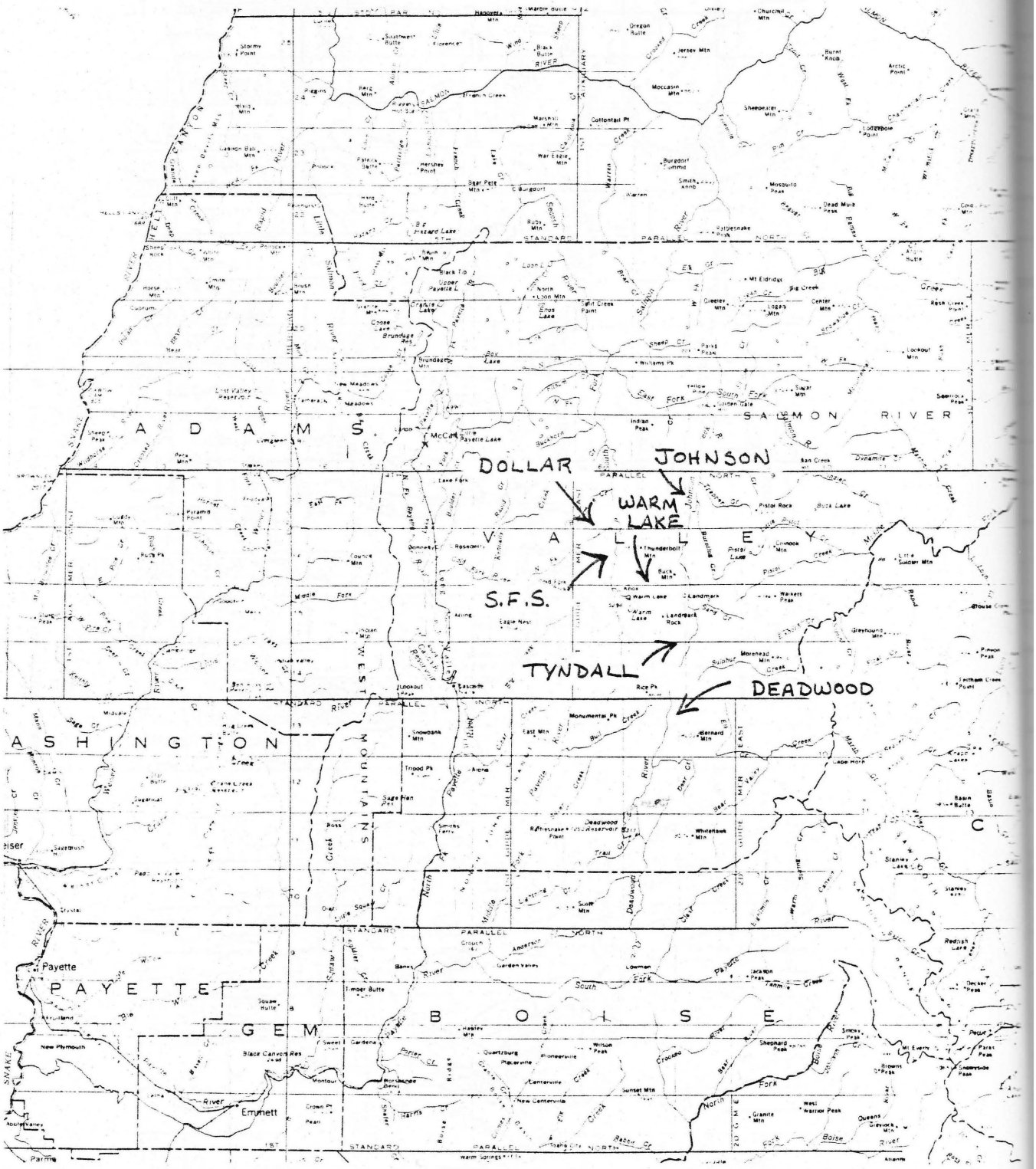


Figure 3

Drainages Sampled in the South Fork Salmon River Area

A total of 166 stands were sampled; 70 sites in the South Fork Salmon River area and 96 sites in the Centennial Mountains. Among these, 145 soil pits and auger holes were dug to classify the soils. As a general rule, stands were not sampled unless they were at least twice the size of the sample plot. Exceptions, described below, were made for unusual communities.

Most stand locations were plotted on aerial photo overlays. When the photos were not available, stands were indicated on topographic sheets. Information to aid in relocating stands (especially those without photos) was recorded on the vegetation data sheets as "Reference Info".

## Site Selection and Sampling

Within a chosen stand, sample plots were subjectively placed to typify the stand. Large stands were preferred to avoid the influence of adjacent vegetation communities. The typical vegetation plot was a 5 x 10 m rectangle. Species cover values and plant group heights were estimated within the plot (Figure 4a). Environmental data collected at each site is represented in Figures 4b. The content and methods of data collections were chosen to be compatible with data collected in previous years' projects.

The size of plot was constant throughout the study but the shape was infrequently changed to accomodate "stringer communities." Vegetation association which occupied narrow strips along stream courses were sampled with a plot 20 m long and 2.5 m wide.

Soils were investigated at most sites. A soil pit was generally dug and/or augered to 1 m either within the plot or adjacent to it. Where variation in topography within the plot, suggested different soils, e.g., flat areas supporting Salix and deep channels of Carex, the pit location was generally chosen to represent the overstory's substrate. The "average" within the plot was sought, i.e., not the wettest or the driest location. At all locations, notes were taken to describe variation within sites.

A standard pedon description was made at each site. Sufficient data were collected to classify the soil to the family level and to develop management interpretations (Soil Survey Staff, 1975). Supplemental information was recorded as necessary for an understanding of soil genesis or vegetation-soil relationships (Figure 4c).

Summary tables of classification units, pedon discriptions and interpretations are found in Appendices E and F.

Creek or area code —

| SHRUBS (5) | cover | ht (dm) |
|---|---|---|
| 1 | | 10-15 |
| 2 | | |
| 3 | | |
| 4 | | |
| 5 | | |
| 6 | | |
| 7 | | |
| 8 | | |
| 9 | | |
| 10 | | |
| 11 | | |
| 12 | | |
| 13 | | |
| 14 | | |
| 15 | | |

↑ indicates average height in dm. for vegetation class

| FORBS | cover | ht (dm) |
|---|---|---|
| 1 EQUI ARVE | 4 | |
| 2 | | |
| 3 | | |
| 4 | | |
| 5 | | |
| 6 | | |
| 7 | | |
| 8 | | |
| 9 | | |
| 10 | | |
| 11 | | |
| 12 | | |
| 13 | | |
| 14 | | |
| 15 | | |
| 16 | | |
| 17 | | |
| 18 | | |
| 19 | | |

↑ abbreviation of species name

↑ cover class within plot,

| TREES | plot sampled O/T | cover | ht |
|---|---|---|---|
| 1 | | | |
| 2 | | | |
| 3 | | | |
| 4 | | | |
| 5 | | | |
| 6 | | | |
| 7 | | | |

↑ indicates range of height variation within species

| FORBS continued | cover | ht (d |
|---|---|---|
| 20 | | |
| 21 | | |
| 22 | | |
| 23 | | |
| 24 | | |
| 25 | | |
| 26 | | |
| 27 | | |
| 28 | | |
| 29 | | |
| 30 | | |
| 31 | | |
| 32 | | |

| GRAMINOIDS | cover | ht (d |
|---|---|---|
| 1 CARX ROST 581 | | |
| 2 | | |
| 3 | | |
| 4 | | |
| 5 | | |
| 6 | | |
| 7 | | |
| 8 | | |
| 9 | | |
| 10 | | |
| 11 | | |
| 12 | | |
| 13 | | |

↑ indicates Mutz 1982 collection # for voucher

Figure 4a

Site #: WI-6 NW ← staked at NW corner of plot

Date: _____

Reference info: descriptive information for relocating plots

Elev _____ ft/ _____ m (estimated from topographic sheet) Slope _____ % Aspect _____

WB type: U V V ⌊ ⌊ width:

Position in bottom:

Microtopography:

Disturbance:

Surrounding communities:

Water depth: motion:

General appearance:

SITE : DATE: PHOTO: LOCATION: VEGET:

| DEPTH | HORIZON | COLOR MOIST | COLOR DRY | TEXTURE | FRAG% | STRUCTURE | CONSISTENCY DRY | CONSISTENCY MOIST | CONSISTENCY WET | ROOTS | MOTTLES | BOUNDAR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |

LANDFORM _____

MICRO-RELIEF _____

SLOPE % _____ ASPECT _____

EROSION _____ GWL _____

DRAINAGE _____ INT. _____ EXT.

INFILTRATION _____

OBSERVATIONS

Productivity ($gm/m^2$) of new community types was estimated using 3 sample sites per community type. Weights of forbs and graminoids were estimated in ten 2 x 5 dm microplots at each site. Herbage was cut and weighed in 3 of the microplots at each location. A linear regression of estimated vs. actual weights, forced through the origin, was used to correct all estimates. Representative samples from each site were air dried to convert fresh to dry weights.

Shrub production was estimated in 5 meter-square subplots using the non-destructive sampling technique of Andrew et al., 1979. Unit shrubs used for estimation were also air dried and reweighed.

Results of the productivity sampling are reported in Appendix D.

## DATA ANALYSIS

### Plant Taxonomy

To aid in accurate classifications, a reference collection of plants was made during the field season. These were checked in the Garrett Herbarium, University of Utah and the Forest Service Herbarium in Ogden. Salix species were verified by M.E. Lewis and S. Goodrich of the Forest Service, S. Brunsfeld, University of Idaho and R. Dorn, State of Wyoming. B. Albee and L. Arnow of the Garrett Herbarium verified forbs and grasses respectively. M. Lewis verified Carex species. Portions of the collection were deposited at all three herbaria.

For the sake of simplicity, nomenclature follows Hitchcock et al., 1969 with few exceptions. A species list of riparian zone plants of the study areas is found in Appendix A.

A few species require comment:

1. The authors were not able to distinguish Salix monticola and S. barclayi in the field. All willows keying to either species have been treated as S. barclayi.

2. No attempt was made to distinguish Salix myrtillifolia and non-glaucous S. rigida; the name myrtillifolia is used for this group. Glaucous forms are reported as S. rigida.

3. Salix eastwoodiae specimens were identified by Brunsfeld and Dorn. Variability in pubescense and leaf shape of S. eastwoodiae in the South Fork Salmon area makes distinguishing this species from S. wolfii

| SITE # | PLANT GROUP | WET WT. | DRY WT | | NUMBER OF UNITS FOR SHRUBS (VARIABLE SAMPLE SIZE) OR WEIGHTS FOR HERBACEOUS | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | GRASS/GR | | | est / act | | | | | | | | | | | |
| | FORBS | | | est / act | | | | | | | | | | | |
| | SHRUB | | | | | | | | | | | | | | |
| | SHRUB | | | | | | | | | | | | | | |
| | GRASS/GR | | | est / act | | | | | | | | | | | |
| | FORB | | | est / act | | | | | | | | | | | |
| | SHRUB | | | | | | | | | | | | | | |
| | SHRUB | | | | | | | | | | | | | | |
| | GRASS/GR | | | est / act | | | | | | | | | | | |
| | FORB | | | est / act | | | | | | | | | | | |
| | SHRUB | | | | | | | | | | | | | | |
| | SHRUB | | | | | | | | | | | | | | |
| | GRASS/GR | | | est / act | | | | | | | | | | | |
| | FORB | | | est / act | | | | | | | | | | | |
| | SHRUB | | | | | | | | | | | | | | |

var idahoensis difficult at a distance. Young S. eastwoodiae with serrate, glandular tipped leaves looks like a hybrid of S. wolfii x S. myrtillifolia.

Tuhy and Jensen (1982) considered S. eastwoodiae and S. commutata synonomous and used commutata following Hitchcock and Cronquist (1976). Dorn does not synonomize these species. We follow Dorn here and it appears to us that the S. commutata voucher specimens of Tuhy are probably S. eastwoodiae based on leaf shape, size and pubescense and the pubescense of capsules. We have, therefore, considered S. commutata in their plots to be S. eastwoodiae.

The small distinctly large leaf willow Dorn calls Salix commutata was infrequently encountered only at higher elevations in Tyndall Meadow, South Fork Salmon area. At the one site sampled (DW-2) it grew with Carex scopulorum. Whether S. commutata and eastwoodiae are separate species, can be distinguished or need to be distinguished for our purposes is yet unclear.

4. Distinguishing Aster and Erigeron species from basal leaves is difficult. Where no identifiable vegetative or flowering specimens in the vicinity suggest otherwise, Aster foliaceous was assumed. Purple tips on involucral bracts as well as leaf shape and length was used to distinguish A. foliaceous and A. occidentalis.

5. Valeriana occidentale and V. dioica are difficult to separate according to Hitchcock et al. (1969). All were recorded as V. dioica.

6. All vegetative herbaceous Spirea were considered S. densiflora.

7. Shrubby Artemisia species follow Winward (1980).

## Study Area Environments

This project was originally perceived as two individual studies - supplemental work on the South Fork Salmon and a separate project of unknown scope in the Centennials. Although the areas are several hundred miles apart, the constants of riparian environments permitted us to pool the vegetation data. Similarity of vegetation is fortuitous because of the

limited number of samples available from each location.

A brief comparison of the physical environments of these areas will provide a basis for comparing riparian community types.

The Centennial Mountains are an east-west range on the Idaho-Montana border in eastern Idaho. The area is part of the Northern Rocky Mountains Physiographic Province (Hunt, 1967). Land of the Targhee National Forest rises from an outwash plain (6500 feet elevation) northward to glaciated summits at 9900 feet. This range combines steep rocky summits, rolling hills at middle elevations and broad flat bottomed valleys. Riparian areas at higher elevations are mainly limited to narrow creeks, pond margins and mesic meadows watered throughout much of the summer by snow melt. Lower valleys are diverse in size and shape but do not include the large river systems sampled in other studies e.g., Greys River or the South Fork Salmon.

Compared to the vast batholith of the Salmon River country, the Centennials are geologically complicated. From Sheridan Creek eastward, the area is an intricate mosaic of Paleozoic and Mesozoic dolomite, limestone and sandstone. Westward the Mesozoic siltstones, limestone and sandstones alternate with Cenozoic rhyolite over large areas. Generally weathering of these materials has produced finer soils than those encountered in the Salmon River area. Coarse textured soils are primarily encountered only along fast flowing streams in the Centennials.

The climate of the Centennials is classified as Humid Microthermal with cold moist winters. Precipitation averages 28 inches annually with 18 inches in October through March. Winters are long and cold with mean January temperatures of 21°F. Temperatures average 63°F in July (McCall, Idaho; USDC, 1980).

The vegetation of the Centennials is primarily lodgepole pine with some spruce and fir at higher elevations. The forests have been heavily damaged by the Mountain Pine Beetle. Sagebrush is abundant both at the low elevation forest boundary and on rolling hills at upper elevations, particularly to the west end of the study area.

Cattle and sheep are both grazed in the Centennials. Because of the late spring in 1982 most sampling was completed before livestock were turned into the drainages. The exception was Miner's Creek which was heavily grazed and, therefore, received limited sampling. Other uses of the area include logging, firewood cutting and recreation. The study area is to the west of Henry's Fork of the Snake River and Island Park Reservoir, popular fishing areas.

The Salmon River area is also part of the Northern Rocky Mountains Physiographic Province (Hunt, 1967). Sampling was confined to middle and upper reaches of the South Fork Salmon River, Johnson Creek, Deadwood Creek and their tributaries. Extremes of riparian habitat included steep

V-canyons of a roaring South Fork Salmon and the wide glacial valley called Tyndall Meadow on Johnson Creek. Elevations ranged from 5150-6800 feet.

The Salmon River Mountains are part of a great granitic batholith. As indicated, soils derived from these quartz deposits are generally much more coarse than those of the Centennials. The exception is Tyndall Meadow where the grinding of glaciers has produced soils high in silts.

The climatic of this region is similar to that of the Centennials with 31 inches of annual precipitation with 19 inches in winter. January temperatures average 19°F, August's average 59°F (Island Park Dam, USDC, 1980). Sampled early in July of a very wet year, soils in the Salmon area may appear to be much wetter than comparable sites or cts from the Centennials.

Spruce and fir dominate most of the forests surrounding the riparian areas. The area has been logged and is a popular firewood cutting area. Grazing has been limited. No grazing took place in 1982 before sampling. Both Tyndall Meadow and the South Fork Salmon have experimental grazing enclosures for grazing-fisheries observation. This portion of the Boise National Forest includes Warm Lake, a popular recreation area.

We encountered some floristic differences between areas. Most notable is the absence of Salix commutata, S. eastwoodiae and dirth of Alnus in the Centennials. Understory differences were also noticed and seemed to affect clustering of plots mainly in the mesic to dry end of the spectrum. Much of our sampled "difference" between the areas is an artifact of the limited range of habitats we had the opportunity to visit in the South Fork Salmon area.

## Data Reduction

After field work was completed, vegetation data were organized into table form (Appendix G). Species which were found infrequently (in less than 2% of all sites) and/or only in trace amounts were eliminated from the final tables (see Appendix B for species abbreviations used in association tables).

Because stands had been subjectively chosen, cluster analysis was performed on the reduced data matrix in order to get a more objective "opinion" on similarity among sites. Coverage value classes were transformed with the same procedure used by Tuhy and Jensen (1982). The CLUSTAR program developed at Utah State University (Marshall and Romesburg, 1977) clustered the sample sites using the unweighted pair-group method of arithmetic averages and the Bray - Curtis coefficient of similarity.

Three dendrograms were produced: one using all plots, one of only shrub dominated plots and a third clustered only herbaceous plots. These are included as Appendix C.

Although many of the stands had been sampled with the expectation that they "fit" within a given community type, the dendrograms proved invaluable for clearing out the cobwebs and a few preconceived ideas. Although the authors did not strictly adhere to CLUSTAR's groupings, the trees provided broad categories and decided several marginal cases.

The classification system is based principally on vegetation characteristics and will be used eventually in the field without the benefit of soils descriptions. Soils and environmental data were, however, helpful in making reasonable units. They are also used to describe and explain the environments of plant assemblages which repeat themselves in space.

Estimating the relative availability of moisture in riparian soils is not straight forward when soils are studied in different areas and throughout the summer. While depth to ground water level is reported we rely heavily on mottling in profiles to reflect intermittent reducing conditions and as an indicator of "normal" ground water behavior. Along with other soil characteristics, depth to the uppermost mottled horizon is included in Appendix F.

Ground water level fluctuations throughout the year are partially a function of depth and permeability (texture) of the most restrictive horizon. Thus, if a fine textured horizon is present in lower portions of the profile there is a tendency for the water table to remain perched. Its lowering lags behind that of surrounding streams. Given a permeable subsoil, the ground water level tends to be closely related to stream levels. For this reason, depth to the uppermost low-permeability horizon is also included in Appendix F.

In the interest of good management of riparian areas, drainage class, runoff potential, soil permeability and inherent erodibility were estimated from selected soil characteristics. These interpretations rely heavily on field assessment of soil texture and topography. A great deal of subjectivity is involved and many soils could not be easily placed in the categories defined (see Appendix F). These characteristics are valuable for predicting the affect of excessive use or denudation on riparian communities. They do not necessarily indicate current conditions. Vegetation may, for example, substantially stabilize soils which are inherently highly erodibile.

## THE CLASSIFICATION SYSTEM

The following section catalogs and describes riparian community types of the study areas. New types being defined in this project are described in detail. Community types described by earlier projects of this Intermountain program (Norton et al., 1981; Mutz and Graham, 1982 and Tuhy and Jensen, 1982) are only briefly treated. In the latter case only one or two plots of each type were sampled and would not provide adequate data for extensive discussion. Where our observations were at odds with data in other reports, we attempt to reconcile or at least explain discrepancies.

In describing cts we use vegetation and environmental data from previous studies whenever possible. We feel this somewhat compensates for the inadequacies of less than 170 sample sites. For the convenience of the reader and in order to better illustrate some of our groupings, we have reproduced selected data tables in Appendix H.

Our philosophy in developing this classification system is to be a "splitter" in describing units and to let the land managers "lump" according to their own needs. What can be lumped for fisheries habitat management, for example, is not necessarily a reasonable grouping for livestock management. Community type names should be descriptive. A name is generally included for each vegetation strata represented, in our case shrubs and herbs. These are separated by a slash (/). Occasionally an understory strata cannot be given a specific name due to high variability among stands.

Community types are not necessarily dominance types. Species used to name types are not always dominant or even codominant but they should have very high constancy. We prefer to include two species names per strata if it more clearly identifies characteristic constituents of the community. These we separate with an hyphen (-).

The riparian classification project is maturing but it is still young. Several sites from each year do not really fit into defined types. As more areas are sampled, we may create niches for these sites. In the interim, we prefer to leave them in general categories, e.g., "DRY MEADOW", rather than subsume them into a floristically different group (See ASIN - FEID and ELPA discussions).

Table 2 is a summary and distillation of classification units described in this study and those cited above. A few of Tuhy's Sawtooth Valley units (1981) have also been included when we feel they more clearly identify communities during the Tuhy and Jensen, 1982 project. Where we have no experience with one of Tuhy's units, we have left it out of the summary. Columns 2 to 6 of the table indicate in which regions each community type has been observed. These assignments are based on

data from report summary tables and field forms obtained from the various projects.

While no area is likely to include all of the types listed, we feel that a key most useful for future projects should include all of the cts described to date. We, therefore, provide a general key rather than area keys for the Centennial Mountains and the South Fork Salmon.

| | SOUTH FORK SALMON<br>MUTZ & QUEIROZ, 1983 | CENTENNIALS<br>MUTZ & QUEIROZ, 1983 | SALMON/MIDDLE FK<br>TUHY & JENSEN, 1982 | SAWTOOTH VALLEY<br>TUHY, 1981 | GREYS RIVER<br>NORTON ET AL., 1981 | WYOMING RANGE<br>MUTZ & GRAHAM, 1982 |
|---|---|---|---|---|---|---|
| CARO | CARO | CARO | CARO[P] | CABU-CASA<br>CARO-CAAQ | CARO | CARO |
| CAAQ | CAAQ | CAAQ | CARO[P] | | | |
| CASI | CASI | * | CASI | | | CASI |
| CANE | | CANE | | | | * |
| ELPA | ELPA | | | | | |
| SCCE-CALI | | | ELPA[P] | SCCE-CALI | | |
| JUBA | JUBA | JUBA | JUBA-MUFI | | | |
| MECI | | MECI | | | SABO/MECI | ? |
| MIPE | | * | MIPE | SADR/RILA/THOC[P] | SABO/MIPE | |
| CACA | CACA | CACA | | | | |
| DECE | DECE | DECE | DECE | POPR[P] | POPR[P] | ? |
| POPR | * | POPR | POPR[P] | POFR/POPR[P]<br>POPR[P] | POPR[M] | |
| MESIC G.M. | MESIC G.M. | MESIC G.M. | POPR[P] | POPR[P] | POPR[P] | |
| ASIN-FEID | ASIN-FEID | ASIN-FEID | ASIN-FEID[P] | ASIN-FEID | | |
| DRY MEADOW | * | * | ASIN-FEID[P] | BROMUS-STOC | | |
| AGSC-bar | | | AGSC-bar | AGEX-AGSC | | |
| POFR/DAIN | POFR/DAIN | | POFR/DAIN[P] | POFR/DAIN | | |

Table 2. Summary of Community Types

| | SOUTH FORK SALMON<br>MUTZ & QUEIROZ, 1983 | CENTENNIALS<br>MUTZ & QUEIROZ, 1983 | SALMON/MIDDLE FK<br>TUHY & JENSEN, 1982 | SAWTOOTH VALLEY<br>TUHY, 1981 | GREYS RIVER<br>NORTON ET AL., 1981 | WYOMING RANGE<br>MUTZ & GRAHAM, 1982 |
|---|---|---|---|---|---|---|
| POFR/POPR | | POFR/POPR | POFR/DAIN[P] | POFR/POPR | * | |
| POFR/DECE | | | | | | POFR/DECE |
| ARCA | | ARCA | ARCA[P] | | * | |
| ARCA/FEID | | | ARCA[P] | ARCA/FEID | | ARCA/FEID |
| SAPH/CARO-CAAQ | SAPH/CARO-CAAQ | SAPH/CARO-CAAQ | SALIX/CARO[P] | SALIX/CARO-CAAQ[P] | | |
| SAWO-BEGL/CARO-CAAQ | SAWO-BEGL/CARO-CAAQ | SAWO-BEGL/CARO-CAAQ | SALIX/CARO[P] | SALIX/CARO-CAAQ[P] | SAWO/CARO | SAWO/CARO |
| SAEA/CARO-CAAQ | SAEA/CARO-CAAQ | SAEA/CARO-CAAQ | | | | |
| SAWO/SWPE-PEGR | * | SAWO/SWPE-PEGR | SAWO/SWPE | BEGL/LOCA/SEPS[P]<br>SAWO/SWPE | SAWO/SWPE | SAWO/SWPE |
| SAEA GR/CASC | SAEA GR/CASC | | SACO/CASC | | | |
| SAWO-SAEA/MESIC H | SAWO-SAEA/MESIC H | SAWO-SAEA/MESIC H | SAWO/CAMI | | SAWO/POPR[P] | |
| SAWO/POPR | | | | | SAWO/POPR | SAWO/POPR |
| SALX-BEGL/CARX-JUNC | SALX-BEGL/CARX-JUNC | SALX-BEGL/CARX-JUNC | | | | |
| SAGE/CARO-CAAQ | SAGE/CARO-CAAQ | SAGE/CARO-CAAQ | SALIX/CARO[P] | SALIX/CARO-CAAQ[P] | | |
| SADR-SAMY/CARO-CAAQ | | SADR-SAMY/CARO-CAAQ | SALIX/CARO[P] | SALIX/CARO-CAAQ | SABO/CARO | SABO/CARO |
| SAGE/POPA | | SAGE/POPA | | | | |
| SAGE-SAMY/DRY C | | SAGE-SAMY/DRY C | | SAGE/GEMA[P] | | |
| SAGE/CACA | | SAGE/CACA | SAGE/CACA | SAGE/GEMA[P]<br>BEGL/LOCA/SEPS[P] | | |

Table 2. Summary of Community Types

| | SOUTH FORK SALMON<br>MUTZ & QUEIROZ, 1983 | CENTENNIALS<br>MUTZ & QUEIROZ, 1983 | SALMON/MIDDLE FK<br>TUHY & JENSEN, 1982 | SAWTOOTH VALLEY<br>TUHY, 1981 | GREYS RIVER<br>NORTON ET AL., 1981 | WYOMING RANGE<br>MUTZ & GRAHAM, 1982 |
|---|---|---|---|---|---|---|
| SAMY/POPR | | SAMY/POPR | SAMY/POPR | SADR/RILA/THOC[P] | SABO/POPR | SABO/POPR |
| SADR-SAMY/CACA | SADR-SAMY/CACA | SADR-SAMY/CACA | SADR/CACA | SADR/RILA/THOC[M]<br>BEGL/LOCA/SEPS[P] | SABO/POPR[P] | |
| SADR-SAMY/COST-TALL F | | SADR-SAMY/COST-TALL F | | | | |
| SAEX/POPR | | SAEX/POPR | | | | |
| SAEX/POPR | | | SAEX | SAEX/POPR | | |
| ALNU-COST | ALNU-COST | | ALIN-COST | | COST-GATRIFL | |
| ALSI | ALSI | | ALSI-MEFE | | | |
| ABLA/CACA HT | ABLA/CACA HT | | ABLA/CACA | PICO/CACA-THOC<br>ABLA/CACA | | |
| ABLA/STAM HT | | | ABLA/STAM | ABLA/STAM | | |
| PIEN/EQAR | | * | PIEN/EQAR | PIEN/EQAR | PICEA/EQAR | * |
| PICEA/GATRIFL | | | | | PICEA/GATRIFL | |
| POTRI | | | | | POAN | |
| POTREM/CAGE | | | | POTREM/CAGE | | |
| PICO/VAOC | | | PICO/VAOC | PICO/VAOC | | |

P = (in part)

M = (most)

* = observed, not sampled

Table 2. Summary of Community Types

# COMPOSITE KEY TO THE RIPARIAN COMMUNITY TYPES OF THE INTERMOUNTAIN REGION

Ia. Site tree dominated

Section A

Ib. Site shrub or herb dominated

IIa. Site with shrub overstory; at least 20% coverage

Section B

IIb. Site with little or no shrub overstory; herbaceous

Section E

## Section A. Tree Dominated Sites

1a. Deciduous trees dominant

2a. Alnus or Cornus spp present with at least 25% coverage

3a. Alnus lncana and/or Cornus stolonifera or Alnus sinuata and Cornus dominate sites; understories diverse.

ALNU-COST ct (p. 30)*

3b. Alnus sinuata over 25% coverage; Alnus incana and Cornus absent.

ALNI ct (p. 32)

2b. Populus angustifolia dominant

Miscellaneous POPU ANGU Communities (1)

1b. Evergreen trees dominant

4a. Picea engelmanni dominant

5a. Galium triflorum, Actaea rubra, and/or Smilacina stellata present in a diverse understory.

PICEA/GALIUM TRIFLORUM ct (1)

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*Page numbers following ct names indicate ct descriptions in this publication. Numbers in parenthesis indicate cts not sampled for the present study but defined in Norton et al., 1981 (1), Tuhy, 1981 (2), Mutz and Graham, 1982 (3) or Tuhy and Jensen, 1982 (4).

5b. Equisetum arvense more than 25% coverage.

PICEA/EQAR ct (1)

4b. Pinus contorta abundant.

6a. Vaccinium occidentale at least 3% coverage; Ledum glandulosum, Lonicera caerulea and/or tatler Betula glandulosa may be codominant or dominant.

PICO/VAOC ct (4)

6b. Calamagrostis canadensis abundant.

PICO/CACA ct (p. 84)

OTHER EVERGREEN DOMINATED SITES SHOULD KEY TO HABITAT TYPES IN ANY REGIONAL FOREST HABITAT TYPE KEY.

## Section B: Shrub Dominated Sites

1a. *Salix* spp. total less than 25% coverage.

2a. *Potentilla fruticosa* dominant; *Artemisia cana* absent.

3a. *Deschampsia cespitosa* charaterizes understory with greater than 15% coverage.

POFR/DECE ct (3)

3b. *Deschampsia* not abundant.

4a. *Danthonia intermedia* greater than 10% coverage.

POFR/DAIN ct (p. 81)

4b. *Poa pratensis* greater than 10% coverage.

POFR/POPR ct (p. 82)

2b. *Artemisia cana* ssp. *viscidula* dominant.

5a. *Festuca idahoensis* with greater than 5% coverage.

ARCA-FEID ct (3)

5b. *Festuca idahoensis* not abundant; understories various.

ARCA ct (p. 83)

2b. *Salix* spp total greater than 25% coverage.

6a. Short *Salix* species dominant; height of vigorous stands less than 1.5 m, usually much shorter.

Section C: SMALL WILLOW GROUP

6b. Tall *Salix* species dominant; height of vigorous stands over 1.5 m.

Section D: TALL WILLOW GROUP

## Section C: Small Willow Group

1a. *Salix phylicifolia* dominant with *Carex rostrata* and/or *Carex aquatilis* greater than 25% coverage.

SAPH/CARO-CAAQ ct (p. 52)

1b. Other *Salix* spp. dominant; *Carex* may or may not be present.

2a. *Salix wolfii*, *Salix commutata* and/or *Salix eastwoodiae* abundant with a wet understory.

3a. Swertia perennis and/or Pedicularis groenlandica present with other wet forbs on mossy surface; Salix wolfii dominant.
SAWO/SWPE-PEGR ct (p. 58)

3b. Not as above.

4a. Carex rostrata and/or Carex aquatilis with greater than 25% coverage.

5a. Salix eastwoodiae dominant
SAEA/CARO-CAAQ ct (p. 56)

5b. Salix wolfii and/or Betula glandulosa are dominant.
SAWO-BEGL/CARO-CAAQ ct (p. 54)

4b. Other Carices or Juncus spp. dominate understory.

6a. Salix eastwoodiae dominant with Carex scopulorum greater than 5% coverage; Calamagrostis canadensis may be abundant.
SAEA/CASC ct (p. 60)

6b. Understory not as above; Salix eastwoodiae, Salix wolfii or Betula glandulosa dominant.
SALX-BEGL/CARX-JUNC ct (p. 63)

2b. Salix wolfii or Salix eastwoodiae dominate a mesic to dry understory.

7a. Salix wolfii dominant with greater than 5% Poa pratensis.
SAWO/POPR (1)

7b. Salix wolfii or Salix eastwoodiae dominant; Poa pratensis less than 5% coverage; various graminoids present.
SAWO/MESIC HERB ct (p. 62)

## Section D: Tall Willows

1a. *Salix geyeriana* dominant with at least 15% coverage; other *Salix* spp. may be present.

2a. *Carex rostrata* and/or *Carex aquatilis* abundant in understory; total at least 25% cover.

SAGE/CARO-CAAQ ct (p. 65)

2b. Above *Carex* species less than 25% coverage; other graminoids abundant.

3a. *Salix geyeriana* and/or *Salix myrtilifolia* in clumped willow stands with dry to mesic herb meadows in wide corridors; tall herbs and small shrubs clustered at willow bases.

SAGE-SAMY/DRY CORRIDOR ct (p. 78)

3b. *Salix geyeriana* dominant with well dispersed graminoid understory.

4a. *Calamagrostis canadensis* dominates understory with at least 15% coverage.

SAGE/CACA ct (p. 71)

4b. *Poa palustris* abundant in understory, usually greater than 25% coverage; herb stratum is usually rich in forb and graminoid species.

SAGE/POPA ct (p. 69)

1b. Other *Salix* spp. dominant.

5a. *Salix drummondiana*, *Salix rigida* and *Salix myrtillifolia* coverage greater than 25%, alone or together; mesic to wet understory.

6a. *Carex rostrata* and/or *Carex aquatilis* dominate understory.

SADR-SAMY/CARO-CAAQ ct (p. 66)

6b. *Carex rostrata* and *Carex aquatilis* may be minor components of understory dominated by other graminoids or forbs.

7a. *Calamagrostis canadensis* greater than 5% coverage.

SADR-SAMY/CACA ct (p. 72)

7b. Forbs or small shrubs abundant in understory.

8a. *Salix drummondiana* or *Salix rigida* dominant; *Equisetum arvense* is abundant and usually conspicuous in understory; stands may include wet forbs such as *Saxifraga arguta*, *Senecio triangularis* and *Mitella pentandra*.

SADR-SARI/EQAR ct (p. 73)

8b. Dense Salix stands; Salix rigida not usually present; Cornus stolonifera, Mertensia ciliata, Heracleum lanatum, Actae rubra or other tall forbs abundant.

SADR-SAMY/COST-TALL FORB ct (p. 75)

9b. Salix drummondiana and/or Salix myrtillifolia or Salix exigua dominant with dry understory.

9a. Salix drummondiana and/or Salix myrtillifolia with dry understory.

10a. Salix myrtillifolia in clumped stands with dry meadows in wide corridors; tall herbs and small shrubs clustered at willow bases.

SAGE-SAMY/DRY CORRIDOR ct (p. 78)

10b. Poa pratensis greater than 5% in understory; herbs well distributed throughout stand.

SAMY/POPR ct (p. 80)

9b. Salix exigua principal willow present.

SAEX/POPR or SAEX ct (1,4)

## Section E: Herbaceous

1a. Carex rostrata and/or Carex aquatilis constitute more than 25% total coverage; Eleocharis pauciflora and Swerta perennis are absent.

2a. Carex rostrata dominant, with or without Carex aquatilis.

CARO ct (p. 34)

2b. Carex aquatilis dominant, usually with little or no Carex rostrata.

CAAQ ct (p. 37)

1b. Carex rostrata and Carex aquatilis less than 25% total coverage; Carex buxbaumii and Carex saxatilis usually absent.

3a. Eleocharis pauciflora and/or Scirpus cespitosus and Carex livida at least 20% total coverage; Deschampsia cespitosa less than 15% coverage.

4a. Eleocharis pauciflora dominant with at least 20% coverage.

ELPA ct (p. 42)

4b. Scirpus cespitosus and Carex livida at least 20% coverage together.

SCCE-CALI (2)

3b. Eleocharis pauciflora and Scirpus cespitosus less than 20% total coverage; where Eleocharis slightly greater, then with less coverage than Deschampsia cespitosa.

5a. Poa pratensis more than 5% coverage; Aster integrifolius, Festuca idahoensis, Stipa occidentalis var. minor and Bromus carinatus absent.

POPR ct (p. 49)

5b. Poa partensis less than 5% coverage; or Aster integrifolius and/or Festuca idahoensis present.

6a. Marginal riparian areas

7a. Aster integrifolius and/or Festuca idahoensis present

ASIN-FEID ct (p. 50)

7b. The above species not present

DRY MEADOW (see p. 50)

6b. Moist to wet stands

8a. Graminoid dominated meadows.

9a. Grass dominated meadows.

10a. Caamagrostis canadensis greater than 20% coverage.
CACA ct (p. 45)

10b. Not as above

11a. Deschampsia at least 10% coverage.
DECE ct (p. 47)

11b. Deschampsia not abundant as above; various other grasses abundant.
MESIC GRAMINOID MEADOW (p. 51)

9b. Carex or Juncus dominated stands.

12a. Carex simulata or Carex nebraskensis abundant.

13a. Carex simulata over 25% coverage; other Carex may be abundant.
CASI ct (p. 39)

13b. Carex nebraskensis over 25% coverage.
CANE ct (p. 40)

12b. Other Carex species or Juncus species abundant.

14a. Juncus balticus greater than 25% coverage.
JUBA ct (p. 43)

14b. Other Carex and Juncus abundant.
MESIC GRAMINOID MEADOW (p. 51)

8b. Not as above

15a. Forb dominated sites.

16a. Mitella pentrandra, Saxifraga arguta, Aconitum columbianum, and/or Senecio trangularis at least 5% total coverage; Calamagrostis canadensis less than 5% coverage.
MIPE ct (4)

16b. Mertensia ciliata usually more than 10% coverage; community rich in tall forbs.
MECI ct (p. 44)

15b. Streambar sites; bare ground consisting of stones, cobbles, gravel or sand comprises at least half the total area. Agrostis scabra mostly present.
AGSC-streambar ct (4)

## Alnus - Cornus stolonifera

ALNU - COST

Alder - Red Osier Dogwood

LOCATION: This ct was sampled in the South Fork Salmon area both along the river and its tributaries and above Deadwood Creek in the southeast portion of the study area. This type includes the ALIN - COST ct of Tuhy and Jensen (1982).

VEGETATION AND PHYSIOGNOMY: Alnus incana and A. sinuata dominated stands are included in the ct. In many stands the species are codominant. When associated with Cornus stolonifera, A. sinuata stands could not be distinguished in vegetation or habitat from the "ALIN - COST" stands sampled. The stands of our sample set seem to be at the mesic end of Tuhy and Jensen's continuum.

The communities include tree (average 40 dm), shrub (10-20 dm) and herb strata. Trees may be clumped or continuous with Ribes lacustre and Lonicera involucrata beneath. Other shrubs including Cornus stolonifera develop both between and under the taller vegetation.

Understories may be open or dense but are rich in herbaceous species including Equisetum arvense, Athyrium felix - foemina, Osmorhiza chilensis, Senecio triangularis, Angelica arguta and Actae rubra.

HABITAT: Mesic sites are either steep slopes associated with small drainages cascading through forests or narrow plains adjacent to a tributary of the South Fork. The substrate of these communities are generally jumbled with boulders, fallen trees and large roots. Although gullies may not run water past mid summer the ct is closely associated with a water source and the mesic atmosphere created by the closed canyons. Streamside communities are affected by high energy flooding in spring.

SOILS: Coarse textured Typic Cryaquent is the dominant subgroup within the sites sampled. A Typic Cryofolist and an Aquic and Cumulic Cryoboroll were also described. With the exception of the Cryofolist and Cumulic Cryoboroll which are on a steep slope, the soils are adjacent to fast flowing streams. As a result, they are coarse textured and recently deposited strata are common. Pedogenesis is restricted to limited organic matter accumulation and mottling. Weekly expressed and buried A1 horizons are also found. The Cryofolist was formed by the accumulation of organic debris within a steep channel of an ephemeral rivulet.

Most plots are less than 100 cm above stream level. Spring floods must be frequent and the water table remains within 100 cm of the surface. An ephemeral stream flows through the Cumulic Cryoboroll site (TM-12). The inherent erodibility is low and permeability, as a norm, is rapid to very rapid.

ADJACENT COMMUNITIES: The small riparian zones of the Alnus sinuata ct are generally surrounded by forest types. Abies lasiocarpa or Pinus contorta with Vaccinium is most common. Abies with a Thalictrum or Symphoricarpos understory were also observed.

DISTURBANCE AND MANAGEMENT: The major disturbance of these areas is made by high volumes and velocities of water in spring. Access to these steep, tangled shrub/tree communities is limited for livestock and large game except where water sources are made more accessible at natural openings or roads. More level streamside sites may also receive more use. Birds and various small animals probably frequent these transitions between the rivers and drier upland forests.

## Alnus sinuata

ALSI

Sitka Alder

LOCATION: This ct was observed in the South Fork Salmon area. It was not observed in the Centennial Mountains and apparently not found on the Middle or Upper Forks of the Salmon since Tuhy and Jensen (1982) recommended it as a ct during their reconnaissance. This ct may also include ALSI - MEFE stands Tuhy and Jensen mention as an incidental type. Of eight sites originally sampled for this type description, only 2 are used here. The others are included in the ALNU - COST ct.

VEGETATION AND PHYSIOGNOMY: Many branched trees of Alnus sinuata, usually over 3 m tall dominate a variable shrub layer. All sites sampled included a discontinuous lower layer of Ribes lacustre. Rubus parviflorus, Lonicera involucrata or other shrub or tree species were also always present.

Sparse understories of these dry sites included traces of Frageria, Achillia, Antennaria spp. and Sedum. Wetter herbs were confined to the margins of nearby water sources and the graminoid component was minimal.

HABITAT: Dry Alnus sinuata communities occupy steep, often rocky slopes in open or wide canyons. WL-1 is associated with Warm Lake Creek but only a narrow band of understory is able to benefit from the water careening over the rocky channel. A dry slope site above the South Fork Salmon has been colonized since aerial photos were taken of a bare slope probably created by road building before 1969. Microtopography is very irregular with boulders, logs and exposed roots. Many alders root below these heavy obstructions and thereby gain stability.

These alder communities are adjacent to or influenced by streams but are marginally riparian considering soils and vegetation.

SOILS: The South Fork Salmon River site is a Typic Cryorthent, light textured throughout. It probably receives runoff from the road but is excessively drained. It appears that although Alnus sinuata grows in wet sites, its distribution is not restricted by abundance of water. The riparian status of this ct is dubious based on soils and vegetation.

ADJACENT COMMUNITIES: ALSI stands are principally adjacent to forest communities. Abies lasiocarpa and Pinus contorta were most common with Vaccinium understories.

DISTURBANCE AND MANAGEMENT: Little use can be safely made of these communities. Erosion potential is high in the steep dry stands where ground cover is limited. Road cuts across these areas are particularly susceptible as evidenced by the stabilization work required on the Warm Lake Road.

Livestock value of this ct is low.

## Carex rostrata

CARO

Beaked Sedge

LOCATION: This herbaceous community type occurs frequently in both the Centennial Mountains and the South Fork Salmon River area. Seven stands, primarily in the Centennials, were sampled in 1982. Both Tuhy and Jensen (1982) and Tuhy (1981) sampled Carex rostrata swards (called either CARO or CARO-CAAQ); data from these stands are used for this description.

VEGETATION AND PHYSIOGNOMY: CARO stands are generally low diversity herbaceous communities. The ideal CARO site is a dense sward of Carex rostrata averaging over 7 dm tall with traces of a few wet or weedy herbs such as Epilobium glandulosum, Mimulus guttatus, Gallium trifidum and Geum macrophyllum. Salix species are occasionally present with less than 5% coverage.

Mutz and Graham (1982) described more diverse, CARO stands with a larger forb component in the Wyoming Range. They considered these transitional to drier cts.

In addition to the relatively pure CARO swards, several stands were observed (2 sampled) which include both Carex rostrata and C. aquatilis in a mixed stand. Three of Tuhy and Jensen's (1982) CARO sites are considered similar to these and are included in this disucssion.

Within a mixed stand, either species may be more abundant (usually C. rostrata) but they are apparently codominant and well mixed i.e. the species are not in mosaic. Precise percent cover of each species is particularly difficult to estimate when the Carices are vegetative. Although C. aquatilis with slightly folded, blue leaf tips can usually be distinguished from clumps of C. rostrata with sharp, triangular leaf tips. Average height (5-6 dm) may be slightly shorter than the pure C. rostrata swards.

Tuhy and Jensen (1982) and Tuhy (1981) combine "pure" C. rostrata, "pure" C. aquatilis and mixed Carex stands into a CARO or CARO-CAAQ ct.

Considering the difference in livestock use of the two species, we feel that C. aquatilis dominated stands should be treated as a separate ct (see CAAQ). Stands just described which contain a mixture of the species are included in the CARO type (a) because C. rostrata often predominates and (b) since the stands are well mixed, use of the vegetation by wildlife and livestock will be substantially

influenced by the rank growth of C. rostrata. If selective grazing of C. aquatilis occurs, the C. rostrata remaining should ameliorate erosive forces, maintain fish habitat, etc.

HABITAT: CARO stands were always sampled in wide valleys (over 100 m) but have been observed in all but narrow V-canyons. Their valley position varies with relation to the main stream course although a dependable supply of water is essential. Substrates are generally planar with only a slight slope ( $< 2\%$). Small channels may occur within stands but these are usually associated with a concentration of the forbs and other graminoids incidental to the CARO communities.

The water table is often at the surface in stands but the surface may dry by mid to late summer.

SOILS: At the subgroup level, the soils supporting this community type are Typic, Cumulic and Histic Cryaquolls, Histic and Typic Cryaquepts and Terric Borohemists. Surface textures of mineral horizons are loamy or finer. Subsurface textures range from sand to clay. The fine textured surface horizons indicate that the velocity of recent annual floods over these sites has been slow and the addition of sediments gradual.

The usual fluctuation of ground water as suggested by topographic position and soil morphology has been restricted to less than 100 cm. The one exception, (STM-2), appears to receive sufficient runoff to remain moist at the surface through most of the summer. In two sites where CAAQ is a significant component of the ct, the lack of long "stable" periods is reflected by buried and thin A1 horizons. One of the soils (WC-8) has a thick Histic epipedon composed primarily of dead very fine roots presumably belonging to the moss carpet. It appears that this root mat has thickened over the years on a clayey horizon.

Soil drainage ranges from very poorly drained to imperfectly drained. The high content of silt of most surface horizons makes these soils highly erodible. Permeability of the most restrictive layer ranges from moderately slow to very slow.

ADJACENT COMMUNITIES: CARO stands are often adjoined by similar Carex swards with either tall (Salix drummondiana, S. myrtillifolia) or short (S. wolfii, S. phylicifolia) willow overstories. CAAQ, JUNC and ELPA cts are also found adjoining or surrounded by CARO stands. Adjacent upland communities include Aspen and Spruce dominated forest types.

DISTURBANCE AND MANAGEMENT: Carex rostrata is relatively unpalatable. Little or no livestock or wildlife use of these stands is evident. The only limited grazing observed was on C. aquatilis in mixed stands. Tuhy noted that stands are very susceptible to animal trailing but that they probably recover quickly (Warm Springs L6a). While inherent erodibility of soils is high, actual erosion in undisturbed communities is limited because of soil stabilization by abundant Carex roots.

Often in close proximity to beaver dams which gave these stands their start, the CARO swards can be disturbed by new beaver activity.

## Carex aquatilis

CAAQ

Water Sedge

LOCATION: Carex aquatilis swards were observed and sampled in both the Centennial Mountains (2 sites) and in the South Fork Salmon area (5 sites). Tuhy and Jensen (1982) sampled only one CAAQ stand (called CARO) which we have included in this discussion. Carex aquatilis stands were not sampled on either the Greys River (Norton et al., 1981) or in the Wyoming Range (Mutz and Graham, 1982).

VEGETATION AND PHYSIOGNOMY: A typical Carex aquatilis stand is a low diversity, dense sward of C. aquatilis. Few if any other species are visable from a distance although small amounts of forbs such as Galium trifidum, Arnica chamissonia, Thalictrum occidentale and Senecio and Aster spp. are often hidden in the sward. Plant heights range from 5 dm on a marginal site to over a meter and average about 7 dm. Small Salix spp. and Lonicera caerula are only occasionally present.

HABITAT: Most Carex aquatilis sample sites are from wide valleys or open meadows. DW-5 was sampled in a plain of the Deadwood River, less than 50 m wide. Sites are relatively planar with few channels and without detrital build-up around plant bases. Only the driest portions of some sites had dead Carex leaves remaining on the ground.

Two of the sites had been sheet washed with sand as an adjacent stream overflowed its banks.

SOILS: Within this community type the subgroups represented are Typic Cryaquolls and Cumulic Cryaquolls. The Typic Cryaquolls display abrupt textural changes near the surface. These result from changes in water velocity and depositional rates. One of the two Cumulic Cryaquolls (SAL-2) is situated in a swale and its water supply is likely to vary as it is closely linked to snowfall. The other is in an abandoned channel and its substratum is coarse textured and underlies a clayey horizon.

In comparison with CARO; CAAQ appears to be more tolerant of changes in ground water level and sudden surges of depositional rates. Its roots are capable of tapping ground water by growing vertically and branching at the water surface. Its growth habit enables it to survive partial burial by depositional surges. These characteristics permit CAAQ to survive adjacent to fast flowing streams.

Soil drainage varies from very poorly drained to imperfectly drained. The ground water level of stream bank sites is closely related to fluctuations of the stream itself. Permeability of the limiting horizon varies from very slow to moderately rapid.

ADJACENT COMMUNITIES: CARO, DECE and MIPE meadows adjoin CAAQ stands. SAWO/CARO, SAPH/CARO and SADR/CARO were also observed.

DISTURBANCE AND MANAGEMENT: The major disturbance on the stands is evidence of flooding. The only difference observed between flood washed (i.e. sand covered) and adjacent unflooded Carex aquatilis was distinctly more flowering Carex in the lower, wetter undisturbed areas.

Little grazing damage was evident in stands sampled. As indicated before, livestock grazing had not begun in most of the study area before sampling. Similar stands on the South Fork Salmon River were closely cropped in experimental grazing enclosures. CARO stands within the same enclosures were only lightly grazed.

## Carex simulata

### CASI

### Sedge

The CASI ct described in the Wyoming Range (Mutz and Graham, 1982) was observed in small stands in both the Centennial Mountains and near the South Fork of the Salmon River. The one stand sampled is a wet herbaceous area dominated by Carex simulata with abundant wet forbs e.g. Pedicularis groenlandica, Dodecatheon jeffreyi and Mimulus primuloides.

Vegetation, habitat and soil characteristics of this small stand are similar to the Wyoming Range ct.

## Carex nebraskensis

CANE

Nebraska Sedge

LOCATION: This ct was observed in the Centennial Mountains. With only 4 rather variable sites it is still inadequately sampled and poorly defined. Additional sampling west of West Camus Creek in the Miner's Creek area and perhaps nearby drainages is important to more clearly define what we consider here as a potential ct.

The ct is similar to a "miscellaneous Carex" type observed in the Wyoming Range (Mutz and Graham, 1982).

VEGETATION AND PHYSIOGNOMY: Despite meager data, CANE is proposed here because of the high forage value of the dominant or codominant graminoid, Carex nebraskensis. The broad, blue blades of this Carex are immediately evident in CANE stands. Care should be taken to distinguish between C. nebraskensis and C. aquatilis in vegetative and/or grazed stands.

Carex nebraskensis coverage generally exceeds 50% although one stand sampled was as little as 10-15%. CANE communities are not tall dense swards like some of the other Carex types. Stands average less than 5 dm tall with some graminoid heads rising above the general vegetative level. Bare or moss covered ground is often visible where sparse Juncus balticus, Eleocharis pauciflora and Muhlenbergia filiformis open up the community. Hordeum, Phleum, Alopecurus and several Carex spp. are also community constituents. Most of the stands had patchy plant distributions.

HABITAT: CANE was sampled in narrow to wide valleys. All sites are associated with intermittent water courses, often in swales which carry water in early summer.

Ponding of water was evident at only one site; ground water levels range from zero to 70 cm. Sites vary from flat to gradually sloping (6%) or undulating. Surfaces are moss covered at about half the sites.

SOILS: Two Cumulic Cryaquolls, a Typic Cryaquoll and a Typic Cryaquept were encountered supporting this community type. Surface and subsurface textures of the Cryaquolls range from clay to silt loam whereas the Cryaquept is coarse textured in its entirety. The fine textured horizons

of the Cryaquolls result from sedimentation from slow moving water and restrict the internal drainage of these soils. As a result, a saturated mat of dead moss roots is present on the surface of two of the Cryaquolls. In-situ pedogenesis is restricted to the accumulation of organic matter (Cryaquolls) and strong mottling (Cryaquept).

Deep coarse-textured (gravelly) horizons within three Cryaquolls represent lithologic discontinuities and are ideal underground aquifers. Free water within this gravelly layer may be elevated to the surface by capillarity. Often the underground water is under pressure. Distinct mottles are absent from the lower saturated horizons of the Cryaquolls whereas the Cryaquept is strongly mottled indicating greater oscillation of the water table.

The inherent erodibility of the Cryaquolls without the protective root mat is high due to a high content of silt.

ADJACENT COMMUNITIES: SAWO/SWPE is the most common adjacent willow ct. Salix geyeriana and/or S. myrtillifolia with POPR understory was found. CANE is often a swale component of larger meadow mosaics of DECE, CACA, JUBA and POPR.

DISTURBANCE AND MANAGEMENT: Very little grazing had been permitted at the sites before sampling. CANE stands should be popular grazing areas since C. nebraskensis is a preferred food. Although heavy grazing may alter the community composition, it should not cause excessive erosion. The concave positions and low energy water characteristics of these sites suggest low erosion potential.

## Eleocharis pauciflora

ELPA

Few Flowered Spike Rush

LOCATION: This herbaceous ct was observed and sampled in the South Fork Salmon area. It was not seen in the Centennial Mountains although small stands of Eleocharis palustris were sampled there (see the MISCELLANEOUS section).

VEGETATION AND PHYSIOGNOMY: The collection of sites Tuhy and Jensen (1982) include in their definition of ELPA are quite variable. The sites sampled on Johnson Creek key to the ELPA herbaceous community but add new variation. Carices aquatilis, rostrata and lanuginosa and Muhlenbergia filiformis are notable associates of our Eleocharis dominated stands.

Without explanation, Tuhy and Jensen (1982) subsume Tuhy's (1981) Scirpus cespitosus - Carex livida SCCE - CALI type under the ELPA ct. They also include a C. scopulorum dominated community within this type. Whether or not there is a more appropriate ct for the C. scopulorum site is unclear but it does seem counter productive to bury the SCCE - CALI ct under the name Eleocharis pauciflora. Tuhy did not include E. pauciflora as an important plant in his SCCE - CALI species list. While Scirpus sites may be infrequent outside Tuhy's Sawtooth Valley, we should recognize them when they occur.

HABITAT: Of the two small sites sampled, one occurs in a small spring fed opening in the forest. The other occurs in mosaic with several other herbaceous communities in a large meadow on Johnson Creek. At both sites water stands and/or moves slowly across the surface.

The sites are relatively flat and planar with relief limited to small hills less than 5 cm high. These slightly drier areas support many of the forbs identified in the plots.

Soils are Typic and Cumulic Cryaquolls with 2-5 cm of surface organic matter. The ground water levels remained at the surface throughout the summer supplied both by nearby seeps and by pressure from below.

## Juncus balticus

JUBA

Baltic Rush

Small stands of Juncus balticus were observed in both the Centennial Mountains and the South Fork Salmon River area. Only 3 sites were sampled. These occupied depressions, apparently ephemeral drainage pathways which may dry each summer. SFS-2 which had slow running water on the surface July 8, was dry and cracked by September 2.

Plant composition and habitat descriptions of sampled sites fit ct descriptions of Tuhy and Jensen (1982) and Mutz and Graham (1982). Although all 3 soils are Typic Cryaquolls, one with a 55 cm organic horizon adds variation to the diverse conditions which are documented for JUBA communities (see Mutz and Graham, 1982 for the dry end of the spectrum).

## Mertensia ciliata

### MECI

### Broad-Leaf Bluebells

The MECI ct described in Norton et al., 1981 was observed in upper reaches of drainages in the Centennial Mountains. Observed along small, steep, often intermittent channels, this community was sampled twice. Similar stands were also observed on the moderately sloping edges of hollows at higher elevations.

Stands sampled are characterized by tall forbs: Mertensia ciliata (only a trace in one stand), Senecio triangularis, Rudbeckia occidentalis, Actae rubra, Thalictrum occidentale and others.

Both narrow sites are adjacent to Abies lasiocarpa/Thalictrum occidentale with gradual boundaries.

Soils are coarse and shallow, classified as Aquic and Cumulic Cryoborolls. In August water moved in these soils at 21 and 77 cm, directly influenced by adjacent streams. These stands may be flooded periodically in spring accumulating mainly medium to coarse materials because of the stream gradients.

## Calamagrostis canadensis

CACA

Bluejoint Reedgrass

LOCATION: Sample sites discussed below include both the South Fork Salmon and Centennials study areas. Centennial sites are not, however, closely allied to each other or the the Salmon River area sites. With further sampling and definition, the more diverse Centennial sites may be placed within another mesic meadow type or be considered conglomerates or transitions. The CACA herbaceous type should be expected in the Centennials since the SADR - SAMY/CACA and SAGE/CACA types were located there.

VEGETATION AND PHYSIOGNOMY: Physiognomy of the CACA ct may be similar to the CARO and CAAQ types. Tall, dense swards of the grass appear almost mono-specific at a distance. A variety of herbs are often included in stands but most are dwarfed by the 6 dm Calamagrostis.

In contrast, the Centennial Mountain sites include two or more codominant graminoids. Herbs are again subordinant. The understory of at least one of Tuhy and Jensen's SADR/CACA include some of these graminoids in abundance e.g. Carex scopulorum.

HABITAT: The ct was sampled in narrow flat bottomed valleys. In the Salmon area, the stands are associated with small streams (Deadwood River and headwaters of the South Fork Salmon) and nearby side slopes.

Sampled in late summer, stream water levels were down 30-50 cm from ground surfaces. In spring, water should be at or near the surface at these sites.

Sites are flat to gently sloping (5%) and relatively planar. The Deadwood site included dry channels and a few small bare areas which probably pond in the spring.

SOILS: Recognized as a repeating herbaceous type in late summer, only 2 soil samples are available for this new ct. Both are from mixed graminoid stands rather than dense, pure CACA swards.

Ground water levels were at 40 and 45 cm in mid August. Coarse and find textures alternate in the Typic Cryaquent at TM-10. Drainage is hindered by an impermeable, very compact silt layer at 60 cm. BT-1

horizons become more coarse with depth until a water logged boulder/ fine loamy layer is encountered.

ADJACENT COMMUNITIES: Adjacent Salix communities include SADR-SAMY/ CACA and SAEA/CASC. CARO, CAAQ and DECE are also nearby. Forest communities dominated by Abies and Picea may be adjacent in these narrow valleys.

DISTURBANCE AND MANAGEMENT: Some natural disturbance was observed in sample stands. Parts of most stands were lodged from bedding and/or wind. Some areas are apparently washed with sand during early spring high water. Based on soil characteristics and topographic position, potential erosion is high but little erosion is evident in stands. Dense vegetation may be compared to either CARO or CAAQ in its stabilization capability. Mixed stands are more comparable to MESIC GRAMINOID MEADOWS or DECE stands in their limited soil holding capacity.

Little grazing was evident in stands although Calamagrostis is a good forage species. Grazing had been excluded from most stands before sampling.

## Deschampsia cespitosa

DECE

Tufted Hairgrass

The DECE ct was observed and sampled in both South Fork Salmon and the Centennial Mountains study areas. Stands sampled keyed to and fit the ct description of both Tuhy and Jensen (1982) and Mutz and Graham (1982).

VEGETATION AND PHYSIOGNOMY: Deschampsia cespitosa with as little as 15% coverage and usually over 25% coverage is a conspicuous component of these rich meadows. One or more other graminoids are usually abundant but are not usually constant among stands. Forbs including Ranunculus alismaefolius, Polygonum bistortoides, Potentilla gracilis and Penstemon globosus are both important and frequent community components.

HABITAT: Most stands are located in large meadows at middle elevations. DECE communities are in mosaic with other herbaceous communities - both wetter and drier. Vegetation within stands is usually patchy and boundaries between stands are gradual and often seem arbitrary as the density of Deschampsia waxes and wanes. Stands are not typically adjacent to creeks but may be saturated to the surface in early summer. Even the wettest site (SFS-7) to the side of Stolle's Meadow was dry by early September. Depth to ground water ranged from 0 to over 100 cm, depending heavily on the time of sampling.

SOILS: Soils include Cumulic and Typic Subgroups of Cryaquolls, an Aquic Cryoboroll and a Typic Cryaquept. Organic surface buildup is minor. Surface horizons are mostly loams and silt loams but may be underlain by medium to very coarse textured materials.

ADJACENT COMMUNITIES: As indicated, DECE communities are usually within large meadows where all other mesic to dry herbaceous types may be in mosaic. CARO, CAAQ and ELPA stands are not usually adjacent unless the meadow is terraced. Stringers of willow species may dissect DECE stands cut with channels or small creeks.

DISTURBANCE AND MANAGEMENT: Most of the areas were not being grazed so little disturbance was evident in stands. JC-10 is probably the only site grazed annually; it showed some tracking and a few bare areas. These mesic but stable meadows were heavily grazed in other parts of the study areas e.g. West Camas and Miner's Creek.

Vehicle tracks were another significant disturbance in this type. While able to support more vehicle traffic than wet sites, damage can be done to DECE areas if traffic is permitted while still saturated in early summer.

## *Poa pratensis*

POPR

Kentucky Bluegrass

This herbaceous community type was observed in both study areas but sampled only in the Centennial Mountains (2 sites). Tuhy and Jensen (1982) document the type for the Salmon River area.

Species composition and habitat features of the sampled sites fit within the ct limits defined by Tuhy and Jensen (1982).

## Aster integrifolius - Festuca idahoensis

### ASIN - FEID

### Thick Stemmed Aster - Idahoe Fescue

Dry meadows keying to and fitting the ASIN - FEID description were observed in both the South Fork Salmon River and Centennial Mountains areas.

Three sites were sampled, all of which included either Aster integrifolius, Festuca idahoensis or both. Even with these species in common, the cluster analysis did not indicate close affinities among these sites.

We do not agree with Tuhy and Jensen's grouping of diverse herbaceous communities under a given name when the species named are present in only half of the sites used for description. Even secondary species such as Stipa occidentalis and Bromus carinatus fail to occupy all of the remaining sites. We do not doubt that the dry herbaceous communities are variable but would prefer the title "DRY MEADOW" to ASIN - FEID when the latter is so misleading. In Tuhy's study of the Sawtooth Valley, Idaho his ASIN - FEID ct had very high constancy of Festuca. Perhaps the ASIN - FEID ct should be maintained as described by Tuhy (1981) and some of Tuhy and Jensen's sites should just be considered DRY MEADOW communities until a more appropriate name is found.

## MESIC GRAMINOID MEADOW

Mesic gramnoid dominated meadows which do not fit into defined cts have been sampled during every project. Often they have been included in very general types along with stands which have similarities among themselves. For example, in the POPR type of Norton et al. (1981) are several stands which fit the DECE or POPR types of Tuhy and Jensen (1982) and several which do not.

A cursory look at POPR types from earlier studies and several one-of-a-kind mesic meadow stands sampled this year shows predominance of various Carex species particularly C. microptera and C. athrostachya and Juncus species other than J. balticus. Hordeum brachyantherum and Alopecurus alpinus are also abundant in some stands. Cluster analysis indicates floristic similarities among small groups of sites but little similarity among them all.

When viewed on the small scales associated with sampling, large meadows usually include these small to large undefined herbaceous stands. If the meadow is viewed on a large scale, more appropriate to wildlife or livestock management, much of the meadow could be classified as DECE or POPR with patchy species distributions.

We suggest this general type to accomodate the odd-ball meadow communities which may one day be included in a yet undescribed, distinctive type.

## Salix phylicifolia/Carex rostrata-Carex aquatilis

SAPH/CARO-CAAQ

Tealeaf Willow/Beaked Sedge-Water Sedge

LOCATION: The ct is found both in the Centennial Mountains and in the Salmon River area. Two sites from the Centennials, 4 from the South Fork Salmon and 2 sites from the Bear Valley and Stanley Basin portions of the 1981 study are included in this analysis. The latter 2 sites were included by Tuhy and Jensen (1982) in their general SALIX/CARO type.

VEGETATION AND PHYSIOGNOMY: The SAPH/CARO is a relatively low profile community. The shrub component varies in percent cover throughout the stands; plot samples are in the 50-75% cover range for Salix phylicifolia. Several stands include at least one other shrub species, usually either Betula glandulosa, S. eastwoodiae, S. wolfii or Lonicera caerula. Shrubs of these stands averaged from 3 to 9 dm with a ct average of about 6 dm.

Carex rostrata dominated the understory of half of the sites, C. aquatilis dominated one and these Carex species and various forbs were codominant at the remaining sites. Understories vary from nearly continuous stands of Carex often exceeding the shrubs in height to more open mixtures of forbs and graminoids. The mixed understories have affinities to the SWPE understory or the drier understory of the SAWO/CAMI ct.

HABITAT: Salix phylicifolia sites are generally flat to slightly sloping and relatively planar. Some sites have a small build up of material at the base of shrubs or tussocks of Carex but sites are not hummocked. The small raised areas appear drier and support mosses but not to the extent of the "spongy" substrate of the Salix wolfii/ Swertia perennis ct.

Water remained at the surface of many SAPH/CARO sites throughout August 1982. Other sites were only moist with the water table as deep as 64 cm (Marsh L3b). The sites, generally occupying wide valleys/meadows, are not usually associated directly with the main stream course. Some occupy low areas marking abandoned or intermittent water courses or are supplied by seeps.

SOILS: Members of the Histic Cryaquolls, Typic Cryaquolls, Typic Borohemists and Terric Borohemists subgroups were represented in the sampled plots. These soils have in common organic horizons within the upper part of the profiles. The thickness of this organic layer varies from 20 (TM-1) to 110 centimeters (WC-10). It consists of a mat of very fine dead moss roots which thickens upward by the addition at the surface. Texture of underlying mineral horizons vary from silty clay loam to coarse sand. One Cryaquoll hosts a buried organic horizon and the subsoil of all Cryaquolls are not mottled. On the other hand, the Cryaquept (TM-7) is strongly mottled throughout. All fine soils receive a nearly constant supply of water, commonly through flow within the organic layer. Reducing conditions appear to persist in the Cryaquolls whereas the Cryaquept must experience alternate reduction - oxidation periods as evidence by the presence of strongly mottled subsurface horizons.

The dominant presence of Carex aquatilis on the Cryaquept (TM-7) suggests that it is better suited to cope with fluctuating ground water than Carex rostrata.

As long as the water supply is not diverted, these soils are protected from erosion by the spongy root mat. If water is diverted, as in the construction of roads, oxidation and decomposition of the root mat will take place and the underlying silty mineral horizons will be very erosion prone.

ADJACENT COMMUNITIES: SAPH/CARO-CAAQ stands gradually change to CARO meadows or more abruptly to drier DECE cts. SAWO/CARO with or without S. phylicifolia and/or Betula glandulosa are also found nearby. Transitions to SAWO/SWPE-PEGR and CASI are observed in the Salmon River study areas.

DISTURBANCE AND MANAGEMENT: Little or no disturbance was observed in this ct. Very little browsing of the Salix was evident. Understories were not visibly trampled or grazed.

Where snowline kill or other events have left stands with many dead branches or branch tips lower shrubs grew vigorously.

## Salix wolfii-Betula glandulosa/Carex rostrata-Carex aquatilis

SAWO-BEGL/CARO-CAAQ

Wolf's Willow-Bog Birch/Beaked Sedge-Water Sedge

LOCATION: Stands were observed and sampled in both the South Fork Salmon River and in the Centennial Mountains areas. Two sites (SALIX/CARO) from the Bear Valley and Stanley Basin portions of the Tuhy and Jensen project are included in this description. The Greys River project (Norton et al., 1982) sampled this type extensively (13 sites designated SAWO/CARO.)

VEGETATION AND PHYSIOGNOMY: Stands sampled in this ct have an overstory dominated by Salix wolfii and a predominantly Carex spp. understory. Salix wolfii, 6 to 10 dm tall (average 8 dm), is often accompanied by Lonicera caerula, Betula glandulosa or other Salix species. Norton et al. (1982) noted the absence of other Salix species in the ct but neither S. phylicifolia nor S. eastwoodiae appears to have been common in the area. Mutz and Graham (1982) also found S. myrtillifolia (boothii) in this ct.

Understories range from low diversity sites dominated by either Carex rostrata or C. aquatilis to higher diversity stands where these and other graminoids and somewhat fewer forbs share the understory. Unlike the strictly herbaceous CARO and CAAQ cts, the understory of this type is seldom limited to either C. aquatilis or C. rostrata. Only 3 of the 18 sites being considered include only one of these species; 2 are CARO. Several are predominantly one species e.g., Beaver L3b is 70% C. aquatilis, 15% C. rostrata. Considering the differences in management potential for these Carex species, it would be valuable for future workers to recognize two phases of this basic type.

HABITAT: Since most of the sites sampled in this type are from the Greys River study area, the reader is referred to Norton et al. (1982) for a detailed description of this type.

Sites are located in medium to narrow (<30m) flat bottomed valleys. Microtopography of sites we sampled is uneven with channelling and some buildup at shrub bases. Moss mats on surfaces and raised areas under shrubs provide slightly drier substrates for forbs.

Water tables were at or near the surface at most sites throughout the summer.

SOILS: Two Typic Cryaquepts, a Terric Borohemist and a Histic Cryaquoll support the communities sampled. Although all profiles have an organic layer at the surface, the nature of this organic layer differs markedly between the Cryaquepts and the other two soils.

The organic layer on the surface of the Cryaquepts consists of a mat of live medium roots, with mats ranging in thickness from 25 to 30 centimeters. These roots presumably belong to one or both sedge species present in the sites. Since the bulk of roots forming this root mat are alive, it does not meet the requirements for a Histic epipedon as described in Soil Taxonomy (Soil Survey Staff, 1975). On the other hand, the organic layer within the Borohemist and Cryaquoll are dead and slightly decomposed. The dead roots are very fine and most likely were produced by the moss carpet that covers the surface. Mat thickness ranges from 27 to 50 centimeters. Similar situations are described elsewhere in this report (see SAPH/CARO-CAAQ). The presence of organic and gleyed horizons, and a near absence of mottles reflect the extreme and consistent wetness of these soils.

At the time of sampling, in early July, the "live root" mats were only partially submerged. It is probable that by forming a thick coarse root mat on the mineral surface, the sedges are capable of avoiding complete root submersion for extended periods of time. On this mat, carpet-forming mosses can become established and in turn contribute to the thickening of this organic layer.

In-situ pedogenesis is restricted to the reduction and removal of iron and the accumulation of organic matter. Fine surface textures imply slow moving water during recent depositional events. Coarse substratums attest to the higher velocity of previous events.

ADJACENT COMMUNITIES: Carex dominated communities are most frequently nearby. These include CARO, CAAQ and SADR-SAMY/CARO-CAAQ. SAWO/SWPE-PEGR is seen in mosaic with the Carex dominated understory of this ct. SAWO-SAEA/MESIC HERB may also be adjacent.

DISTURBANCE AND MANAGEMENT: No disturbance was observed in the South Fork area. Browsing of Betula was obvious in Centennial Mountains stands. Heavier use is expected of Carex aquatilis dominated stands.

## *Salix eastwoodiae*/*Carex rostrata* - *Carex aquatilis*

SAEA/CARO - CAAQ

Eastwood Willow/Beaked Sedge - Water Sedge

LOCATION: This ct was observed only in the South Fork Salmon River area. *Salix eastwoodiae* was not collected in the Centennial Mountains. Tuhy and Jensen (1982) considered it synonomous with *S. commutata* but did not report the latter with a CARO understory. Because of the difficulty in distinguishing between *Salix eastwoodiae* and *S. wolfii* var. *idahoensis* in this area (see discussion under Plant Taxonomy) it is possible that the type occurs in other parts of the Salmon River drainage system but was not distinguished from others of the SALIX/CARO ct.

VEGETATION AND PHYSIOGNOMY: *Salix eastwoodiae* dominates these low to medium profile communities. The even height willow layer varies among sites from 6 to 15 dm. *Salix phylicifolia* and *Lonicera caerula* often contribute a discontinuous shorter shrub layer. *Carex rostrata* and/or *C. aquatilis* ( > 25%) dominate the community understory. Other graminoids are not abundant but from one to several wet forbs are present in trace amounts beneath the *Carex*.

HABITAT: The SAEA/CARO - CAAQ sites occupy narrow to wide valleys throughout the Salmon River study area. Stands were sampled both in open meadow/willow mosaics and nestled into forested areas at the mouth of side drainages and in oxbows. Willow stands seem to be more patchy in the more open situations. Microtopography is uneven at all sites with at least small hummocks beneath shrubs. Most sites showed some channeling, or at least low areas between willow and *Carex* clumps.

Standing to slow moving water was either at or near the surface in early summer although water tables were often deeper. Two sites revisited in August were dry to the surface.

SOILS: Typic Cryaquents and Typic or Cumulic Cryaquolls support this community type. Textures of the upper half of the profiles range from sandy loam to silty clay loam whereas deep subsurface textures are sandy. Lithologic discontinuities are common.

Ground water levels in early July ranged from 0 to 28 cm. In-situ pedogenesis is restricted to the accumulation of organic matter and mottling.

Understories dominated by Carex aquatilis are present on soils that are relatively coarse textured throughout and close to streams. Ground water fluctuation is pronounced and closely associated with stream levels (JC-3, JC-13, JC-17). Carex rostrata understories occur on soils with at least one fine textured horizon (SFS-13 and SFS-15). In one site (SFS-15) Carex rostrata roots form a mat 25 cm thick which lies on the mineral soil surface. Faint mottles and very low chromas suggest that this soil is very poorly drained. Carex rostrata understories appear to require greater constancy of water supply to the surface than Carex aquatilis. This can be achieved by a perched water table and/or capillary rise through fine textured horizons in contact with a water table (SFS-13 and SFS-15).

In summary, soil permeability ranges from very slow to rapid and drainage is poor and closely controlled by ground water levels. Inherent erodibility is moderate to high.

ADJACENT COMMUNITIES: CARO, CAAQ and small areas of wet forbs are commonly adjacent. Pinus contorta forest types were usually adjacent to stands in narrow valleys.

DISTURBANCE AND MANAGEMENT: Johnson Creek sites with Carex aquatilis understories were livestock grazed by late summer and received some use by wildlife earlier in the season. Drier areas in the vicinity were more heavily grazed.

Although soil characteristics indicate erodible soils, communities with healthy vegetation are stabilized by both Carex and willow roots. Destruction of vegetation cover by overgrazing in C. aquatilis dominated stands would likely accelerate erosion.

## Salix wolfii/Swertia perennis - Pedicularis groenlandica

## SAWO/SWPE - PEGR

## Wolf's Willow/Swertia - Elephanthead

LOCATION: This community type described by Norton et al., (1981) was observed in both areas and 2 sample plots were established in the Centennial Mountains.

VEGETATION AND PHYSIOGNOMY: The SAWO/SWPE - PEGR stands sampled generally fit the descriptions provided for SAWO/SWPE in previous reports. An even stand of Salix wolfii averaging 5 dm in height dominates high diversity, moderately dense mixtures of graminoids and forbs. Prominent understory species include Pedicularis groenlandica, Polemonium occidentale, Carex douglassi, C. aquatilis, C. simutata, C. nebraskensis and Juncus spp. We and other authors (personal communication, Dave Winn, U.S.F.S.) have found, however, that Swertia perennis is not as frequently observed in the SAWO/SWPE ct. as Tuhy and Jensen (1982) describe. Whether this is because Swertia does not occur in the stands we visited or because it is not apparent at the time of sampling (it is phenologically late compared to Pedicularis), is unclear. While Pedicularis is not limited to this ct, we believe that its presence in the title is more descriptive of the type's flora composition.

HABITAT: The two West Camas plots, and many others at the upper end of the drainage illustrate the toe slope or side hill habitat of the ct. North to east facing slopes of up to 15° are represented. Despite these slopes soils are saturated to the surface with moisture supplied by surface flow even in late summer.

Both soils have thick organic layers which, in combination with surface moss and ground water, give substrates the resiliency characteristic of this type.

Two sites sampled in Howard Creek (H-5, H-6) have some floristic similarities but are included in the SAWO/mesic herb type based on soils and other habitat data. These small areas occupy flat wide valleys. Neither soil has the typical thick organic matter layer.

ADJACENT COMMUNITIES: Adjacent stands include both short and tall willows with CARO understory and both mesic and wet meadows dominated by Juncus spp. Carex nebraskensis, C. microptera and Phleum alpinum.

DISTURBANCE AND MANAGEMENT: No disturbance of this ct was observed. Cattle had been grazing in the Howard Creek area but had not yet been released into West Camas for 1982. While several species of this type are favored forage, the seepy slopes frequent in this type are not preferred (personal communication, Platts, U.S.F.S.).

The soil/vegetation matrices of these sites are sensitive to the weight of livestock and human use.

## Salix eastwoodiae Group/Carex scopulorum

• SAEA Group/CASC

Eastwood Willow Group/Holm's Rocky Mountain Sedge

LOCATION: Tuhy and Jensen (1982) defined an infrequent Salix commutata/ Carex scopulorum ct for the Upper Salmon and Middle Fork Salmon Rivers. Salix eastwoodiae dominated sites we sampled fit their description with substitution of S. eastwoodiae for S. commutata. Following our discussion under Plant Taxonomy, we feel that these cts are the same. Neither Salix species was found in the Centennial Mountains.

VEGETATION AND PHYSIOGNOMY: Short to moderately tall (5-25 dm) Salix eastwoodiae is usually dominant with Salix phylicifolia and Betula glandulosa also present. Betula is dominant at one site in Tyndall Meadow. Lonicera caerula is frequently present. The stand on Deadwood Creek is dominated by Salix commutata (3-5 dm tall). It includes all of the above mentioned shrubs plus Salix wolfii. Total shrub cover varies from about 30% to over 75%.

Carex scopulorum is present in all understories and is usually dominant with at least 10% coverage. Carex obovoidea and Carex luzulina are frequent and abundant. One of our sites and two from Tuhy and Jensen (1982) are dominated by Calamagrostis canadensis.

We find Tuhy and Jensen's comparison of this ct to SAWO/SWPE (-PEGR) appropriate. While we failed to find Swertia in our Salix wolfii sites, it does appear in our late summer samples of SAEA/CASC. Other wet forbs are also abundant.

HABITAT: Tyndall Meadow sites are on 10-15% east facing slopes above the broad valley. The Deadwood site is a gently sloping (3%) plain on the narrow valley bottom. All stands are fed by seeps with water flowing at or near the surface in some sections. Sites are undulating with surface waters collecting in rivulets.

SOILS: Two Terric Borohemists and Histic Cryaquent support this community type. All three soils are characterized by organic surface horizons. Textures of the underlying mineral horizons range from silty clay loam to loam sand. Lithologic discontinuities are common.

The organic surface horizons consist of a mat of dead very fine roots presumably belonging to the moss carpet which is present at the surface. Water from the lateral moraine seeps flows through these organic horizons limiting the aeration and consequent decomposition of the root mat. As indicated by the near absence of mottles in the mineral horizons, reducing conditions must be the norm. As suggested by Jensen and Tuhy (1982), these organic horizons are an effective sediment filter and play a major role in reducing water velocity. We believe that these horizons thicken upward by the addition of very fine roots immediately below the mossy surface. The limited aeration which reduces decomposition rates depend on the constant supply of water. Care must be exercised not to divert seeps responsible for the maintenance of these sites as this would result in the oxidation and decomposition of the organic layer, increased runoff and siltation of streams. In their present condition, infltration through the organic horizon is very rapid and inherent erodibility is low.

ADJACENT COMMUNITIES: SAWO/SWPE-PEGR is most frequently adjacent. It would not be suprising to find a SAEA/SWPE-PEGR type with further sampling. Considering their similarities, they might eventually be grouped into one ct. CAAQ was observed below one site and Abies frequently adjoined above and to the side.

DISTURBANCE AND MANAGEMENT: The hillside sites are unlikely to receive much use by livestock since they are steep, spongy and have a good willow cover. As indicated above, they are highly susceptible to damage if their water supply is diverted or their organic layer mechanically disrupted.

## Salix wolfii/Mesic Herb

SAWO/MESIC HERB

Wolf Willow/Mesic Herb

Relatively dry Salix wolfii stands in the Centennial Mountains and in the Salmon River area fit the SAWO/POPR type described by Norton et al. (1981) for western Wyoming. This Wyoming type is quite variable with almost half the sites with little (less than 1%) or no Poa pratensis. A similar problem is found with the SAWO/CAMI ct of Tuhy and Jensen (1982).

All SAWO/POPR, SAWO/CAMI sampled to date and the miscellaneous stands listed here should be reevaluated and perhaps more appropriately grouped. This situation is similar to the meadow problem discussed under MESIC GRAMINOID MEADOW.

The soils supporting these communities are Cumulic Cryaquolls and Typic Cryaquolls. Surface horizon textures range from clay to very gravelly coarse sand. Lithologic discontinuities are common and in two cases (COT-4 and COT-9), clayey horizons overlie a gravelly sand deposit which is saturated with water for considerable amounts of time. One soil (COT-9) has a highly decomposed organic horizon which suggests a recent shift to a less wet moisture regime.

In-situ pedogenesis is restricted to the accumulation of organic matter in the A1 horizons and mottling resulting from oscillation of the ground water level. It is possible that the fine textures of COT-4 and COT-9 resulted from the weathering in-situ of sand and silt-sized particles. The sites near Howard Creek (Centennial Mountains) and Johnson Creek are relatively coarse textured. The Howard Creek soils have developed in a deposit with strong physical resemblance to wind
presence of this material on high as well as low ground also suggests eolian deposition.

Ground water levels range from 18 to 80 cm. The most shallow depth to water was measured near Johnson Creek early in the summer. Fluctuations of ground water level in coarse textured soils, two of which were near active stream channels, fluctuate readily with neighboring stream levels.

In general the soils supporting these communities are highly erodible due to the high silt and very fine sand content of surface horizons. The permeability of the soils range from rapid (coarse textured) to very slow (fine textured). They are usually imperfectly drained.

## Salix - Betula glandulosa/Carex - Juncus

SALX-BEGL/CARX-JUNC

Willow - Bog Birch/Sedge - Rush

LOCATION: This general community type is described from Centennial Mountains and South Fork Salmon area samples.

VEGETATION AND PHYSIOGNOMY: Sites clustered together based on floristic similarities but the type is not a cohesive unit. In many sites, Betula glandulosa dominates a dense, rich shrub layer. Frequently codominant species are Salix wolfii and S. phylicifolia. Sites also include an open short shrub canopy of Lonicera caerula and/or Vaccinium occidentale.

Understories are usually rich in both forbs and graminoids, all with low constancy. Carex, Juncus and Luzula species, along with Calamagrosti canadensis and Deschampsia cespitosa can all be abundant.

HABITAT: Several sites were at the edge of forest clearings opened by bog forming seeps. These soils were saturated or had free flowing water within 15 cm. Surfaces are usually mossy in part, with forbs associated with these patches. One stand mentioned below had a ground water level at 75 cm.

Microtopography varies from planar to hummocked and very irregular with old stump, logs and channels. Lowest areas typically support more of the Carex and Juncus species. Several sites are gently sloping (to 5%).

One old Betula stand included here appeared in transition to a drier state. A few large shrubs, up to 2 m tall and 4 m in diameter dominate a mixture of tall forbs and several mesic grass species. This site occupies a small terrace between a SAGE-SAMY/DRY CORRIDOR and Cottonwood Creek. The stream level was almost 1 m below the bank in early August.

SOILS: Soil subgroups include three Typic Cryaquolls, a Typic Cryaquent and a Cumulic Cryoboroll. Soils are medium to coarse textured throughout. One soil includes stream gravels at 25 cm and below. The drainage at sites is only poor to moderate, but mottling of lower horizons indicates at least some fluctuations in the water tables, even at seeping sites.

Organic accumulation is minor except for 8 cm on an abandoned stream channel site (JC-8). This site resembles the SAWO/SWPE-PEGR ct and even includes a trace of Swertia.

ADJACENT COMMUNITIES: PICO/VASC is most frequently surrounding these sites. Small meadows of CAAQ, JUBA and ELPA are often situated slightly lower, toward bog centers.

DISTURBANCE AND MANAGEMENT: Sites were not obviously disturbed although cattle grazed the Johnson Creek area later in the summer. Forest clearing sites were not effected, but JC-8 was moderately grazed. Betula at the Centennial Mountains site was browsed in past years. These moderately wet Betula sites cannot withstand livestock or vehicle traffic. Their frequent location within forests will usually afford them some protection.

## Salix geyeriana/Carex rostrata - Carex aquatilis

SAGE/CARO-CAAQ

Geyer Willow/Beaked Sedge - Water Sedge

LOCATION: This ct is found in both the Centennial Mountain (3 sites sampled) and in the Salmon River area. We sampled the type once in the South Fork area and use one SALIX/CARO site from Tuhy and Jensen (1982). This ct is not as common as other willow with CARO or CAAQ understories.

VEGETATION AND PHYSIOGNOMY: In most stands Salix geyeriana dominates with over 50% cover. Willows are evenly distributed rather than clumped even though sites include both old and young stands. One Tuhy and Jensen site considered, (but rejected) as an example of this type had only 16% S. geyeriana. It's general characteristics are much closer to an herbaceous CARO ct. Salix myrtillifolia, Lonicera caerula and Ribes spp. are occasionally present in the SAGE/CARO - CAAQ ct.

Carex rostrata and/or C. aquatilis dominate a somewhat variable understory. Stand diversity ranges from species poor communities (like CARO and CAAQ herbaceous cts) to stands rich in both graminoids and forbs. Constancy is low for all but the Carex species.

Understories are not dense swards but more open stands of medium height (average 5 dm) graminoids. Carex species tend to cluster in corridors while grasses are more abundant at the base of willows.

HABITAT: The community is generally found in valleys at least 100 m wide. Location within valleys ranges from the forest edge to streamside.

Microtopography is uneven in all sites with hummocking under Salix associated with the larger, older shrubs. Abundance of grasses is also associated with larger older willows. Both factors suggest that the SAGE/CARO-CAAQ ct is probably transitional between wet communities where the Carex would dominate and drier areas where S. geyeriana flourishes with a mixed herb understory. Most sites are elevated above stream level and have Carex concentrated in lower portions of plots.

SOILS: Two subgroups, Cumulic Cryaquolls (1) and Typic Cryaquolls (2) occur in the sites sampled. Surface textures range from silty clay loam to loam. Subsurface textures range from silty clay loam to loamy sand. Ground water levels vary from 20 to 40 cm.

One profile (MC-5) is strongly calcareous throughout. Its moisture regime appears to have been recently changed by ongoing beaver activity. As a result, interpretations based on soil morphology are difficult. Of the two remaining soils, one is a coarse textured Typic Cryaquoll (SFS-17) and the other a Cumulic Cryaquoll which is fine textured down to 60 cm (DR-3). The Typic Cryaquoll hosts at least one buried A1 horizon and two lithologic discontinuities resulting from depositional surges. On the other hand, the Cumulic Cryaquoll has a thick mollic epipedon formed by the gradual accumulation of organic matter and silt and clay particles. This fine textured epipedon serves to buffer the movement of the water table.

It is clear from a standpoint of soil morphology that the water supply and the depositional environment of the Cumulic Cryaquoll (DR-3), are more stable than the water supply and depositional environment of the Typic Cryaquoll (SFS-17). As in other community types with similar understories, the more stable site (DR-3) favors Carex rostrata whereas the more active sites favor Carex aquatilis.

Inherent erodibility of the two Typic Cryaquolls is very high whereas the Cumulic Cryaquoll is moderately erodible. As indicated by the discussion, the permeability ranges from moderately slow (SFS-15 and MC-5) to very slow (DR-3).

ADJACENT COMMUNITIES: Herbaceous CARO-CAAQ stands and Salix drummondiana dominated CARO are most frequently found near SAGE/CARO-CAAQ. Mesic DECE meadows and POFR/POPR were also observed.

DISTURBANCE AND MANAGEMENT: Disturbance was low in most areas. Beaver cutting of willows was apparent in two areas and moose tracks were seen in one stand.

The one drainage which has been grazed by cattle (Miner's Creek) showed heavier usage. Although a closed canopy of willows started at about 2 m, cattle had trampled and muddied the corridors. The smallest corridors were trailed but not as heavily grazed. This community illustrates the difference between inherent and actual erodibility. While inherent erodibility is high, the tall willow and Carex rostrata community have remained viable d spite grazing pressure. Erosion is limited at this site. Comparable grazi access to a C. aquatilis dominated site would probably result in greater us of forage and more erosion.

## Salix drummondiana - Salix myrtillifolia/Carex rostrata - Carex aquatilis

SADR - SAMY/CARO - CAAQ

Drummond Willow - Blueberry Willow/Beaked Sedge - Water Sedge

LOCATION: The SADR - SAMY/CARO - CAAQ ct was observed in both study areas and sampled in the Centennial Mountains. Two SALIX/CARO sites from the Sawtooth Valley area (Tuhy and Jensen, 1982) are included in the description. Norton et al. (1981) described the same community type in the Grey's River area (SABO/CARO) and Mutz and Graham observed it in the Wyoming Range.

VEGETATION AND PHYSIOGNOMY: The community is dominated by a tall shrub layer consisting of Salix drummondiana and/or S. myrtillifolia which average about 25 dm tall. Ribes lacustre and Lonicera involucrata may add a sparse low shrub layer. Betula glandulosa and S. geyeriana are occasionally present.

Carex rostrata and/or C. aquatilis dominate a moderately productive understory. Other herbaceous species are usually present at less than 5% coverage. Equisetum arvense is present most consistently with up to 15% coverage. Species distribution within stands is somewhat patchy with the density of Carex greater in low inter-shrub spaces and forbs concentrated on slightly drier ground at shrub bases.

Moss is common on higher ground but appears and feels distinctly different from the bouncy, boggy substrate of some of the short willow cts (SAPH and SAWO/SWPE-PEGR).

HABITAT: SADR - SAMY/CARO - CAAQ is found in narrow to wide valleys but is not likely in tight V-Canyons. The stands are often associated with slow moving water, e.g. beaver ponds, backwaters or at the base of a seepy slope.

Sites are mostly flat but microtopography is very irregular with stands cut by channels or including small ponds. Shrubs and dead stumps are typically hummocked at the base with low lying areas between. Both water diversion through willow stands and willow sprouting on dams and near ponds probably contribute to this pattern.

SOILS: Three out of four profiles described within this community type are Cumulic Cryaquolls. The other is a Terric Borohemist.

As suggested by the presence of organic horizons (buried and at the surface), lack of mottling and shallow ground water levels, these soils remain saturated through most of the growing season. Thick mollic epipedons are the result of organic matter accumulation under reduced aeration. Buried A1 and O1 horizons reflect periodic depositional periods. Fine textured surface horizons are the result of sedimentation from very slow moving water. One of the Cumulic Cryaquolls (WC-1), has a layer of wood chips produced by beaver. The wood chips still retain their original structure. The fact that they settled in this site attests to the stagnant nature of the water. As described elsewhere in this report (see SAPH/CARO-CAAQ), the Histic epipedon within the Borohemist is formed by moss roots and is constantly saturated with water.

In summary, drainage and permeability of these sites are very poor. Erosion potential of the Cryaquolls is high due to the silt content of the surface horizons. Overgrazing of these sites during a drought year poses a serious threat to streams. In contrast, if healthy vegetation is maintained in these communities, they represent very stable riparian systems.

ADJACENT COMMUNITIES: Dense swards of the CARO ct are frequently adjacent to this willow type. Similar communities with more grass and Equisetum (SADR/CACA) are also adjacent. Where seeps feed this bottomland type SAWO/SWPE-PEGR or a MIPE stand is likely.

DISTURBANCE AND MANAGEMENT: Little evidence of livestock disturbance was visible. With high proportions of Carex rostrata in the understory, this is not likely to receive much domestic grazing.

The most prominent disturbance can be attributed to the community's formative processes. Beaver channels and willow cutting was obvious in places. Continued activity is likely to change the community's configuration periodically.

## *Salix geyeriana/Poa palustris*

SAGE/POPA

Geyer Willow/Fowl Bluegrass

LOCATION: This ct was observed throughout the Centennial Mountains study area. Five sites were sampled in 4 drainages. Elevations range from 6700 to 7200 feet. We did not observe the type in the South Fork Salmon area, nor do any of Tuhy and Jensen's plots fit the following description. From their data, *Poa palustris* does not appear to be as common in the Salmon River region as it is in east-central Idaho.

Closest affinities appear to be with the SAGE/CACA ct. Only one of Tuhy and Jensen's Salmon River sites had an appreciable amount (15-25%) of *Poa palustris*.

VEGETATION AND PHYSIOGNOMY: SAGE/POPA are dominated by tall *Salix geyeriana* usually with over 50% coverage. *Salix geyeriana* was either the only shrub or was accompanied by up to 4 other willow species. Stand heights varied from over 45 dm to 20-25 dm to one stand only about a meter in height. The plots sampled included dense stands of many young willows and stands with just a few old willows comprising the plot. The latter were either dense stands or navigable through corridors.

Understories are rich mixes of mesic graminoids and forbs with *Poa palustris* having 25 to 50% coverage. No other species had both high constancy and high coverage although *Potentilla gracilis*, *Geum macrophylla* and *Ranunculus uncinatus* were frequently observed in at least trace amounts.

HABITAT: All stands were in wide valleys and most were near creeks or abandoned channels (e.g. WC-15 inhabits an oxbow and the Stamp Meadow site is underlain by stream gravels.) Sites were moist in late July and early August but only one was saturated to the surface.

Microtopography varied between stands but showed some undulation from corridor depression to shrub hummock which understandably increased with the size and age of the willows.

SOILS: One Typic and two Cumulic Cryaquolls were described. Surface textures range from loam to clay loam. Subsurface textures range from sandy loam to silty clay. In 4 out of 5 profiles the bottom-most horizon is sandy and commonly underlies fine textured horizons. In one case (WC-15), the profile is coarse textured throughout. Lithologic discontinuities are common in these soils.

Ground water levels vary from 30 cm to more than 100 cm. The shallowest water table was measured in the coarse textured soil. All fine textured soils are strongly mottled below 27 cm. This reflects fluctuations of the water table. The coarse textured soil is within an abandoned oxbow and its surface is slightly above the midsummer stream level. It is likely that the level of the ground water in this soil is not lowered significantly. This insures the moisture supply to the root zone. The soils with fine textured horizons over coarse textured horizons have the ability to provide water to the root zone by capillarity. Thus all these soils can deliver comparable amounts of water even though ground water levels differ considerably.

The inherent erodibility of these soils ranges from moderate to high; permeability ranges from rapid to very slow.

ADJACENT COMMUNITIES: Other Salix geyeriana or S. myrtillifolia cts are most commonly adjacent. These include stands with CARO-CAAQ and CACA understories. Meadows dominated by Poa palustris are adjacent to two sites. POPR meadows are also adjacent to but above this ct.

DISTURBANCE AND MANAGEMENT: Animal disturbance varied among sites but was generally low. Younger stands were too dense for much cattle use. More open sites with larger willows showed some trampling in corridors. Elk bedding and footprints were observed near one stand.

One unusually short stand (Salix averaging about 1 m) had been winter killed (or less likely browsed) to about 7 dm. Regrowth of about 3 dm maintained the even height. Cause of the disturbance is unclear and confounded by the presence of 2 m. tall S. geyeriana in an adjacent bottomland position.

The SAGE/POPA ct must be sampled further to rate it as to erosion potenti Presence of abundant tall willows suggest a good soil holding capability. The stabilizing potential of the relatively open Poa palustris understory is probably less than a CARO sward but better than that of drier understories of cts such as SAMY/POPR.

## Salix geyeriana/Calamagrositis canadensis

SAGE/CACA

Geyer Willow/Bluejoint Reedgrass

LOCATION: Three sites were sampled in the Centennial Mountains. Tuhy and Jensen described this ct for the Salmon River area (1982). One of our sites from the South Fork Salmon (SFS-17) clustered with our Centennial plots but was finally grouped into SAGE/CARO-CAAQ. In this stand Calamagrostis coverage was less than 5%. The 1982 ct description accomodates this low Calamagrostis content and one third of Tuhy and Jensen's SAGE/CACA plots had either no or only a trace of Calamagrostis, but we do not generally agree with such groupings.

VEGETATION AND PHYSIOGNOMY: Both areas sampled were dense even stands of vigorous Salix geyeriana. Besides the dominance or codominance of Calamagrostis canadensis, the understories shared Poa palustris, Bromus ciliatus, Alopecurus alpinus, Arnica chamissonia, Aster foliaceous and others. (With only 3 samples, little can be added to defining the typical SAGE/CACA stand).

HABITAT: All sites occupy gentle slopes (5%) above the main valley bottom. Corridors are narrow to non existent which probably explains a lack of the hummocking described by Tuhy and Jensen (1982).

Two sites are wet with ground water at 12 and 20 cm. The third site, with a ground water level below 100 cm is more typical of the SAGE/CACA communities Tuhy and Jensen describe.

DISTURBANCE AND MANAGEMENT: None of the stands sampled would permit easy access to livestock. Those described by Tuhy and Jensen are more open and perhaps represent older stands which have slowly given way under grazing pressure. The Calamagrostis understory would certainly be an attractive one for cattle.

## Salix drummondiana - Salix myrtillifolia/Calamagrotis canadensis

SADR - SAMY/CACA

Drummond Willow - Blueberry Willow/Bluejoint Reedgrass

Two sites fitting within the SADR/CACA ct were documented in the Centennial Mountains. Since these sites and several of Tuhy and Jensen's are dominated by Salix myrtillifolia we recommended changing the community type name to recognize the potential importance of this shrub.

Since one or the other willow may be dominant or they may be codominant, we have no data to suggest that the ct should be split.

Vegetation and habitat are described by Tuhy and Jensen (1982). Notes on the soils described at our sample sites are below.

Two Cumulic Cryaquolls and one Typic Cryaquoll were described. The Cumulic Cryaquolls are fine textured throughout and one has a thin 01 horizon sandwiched between two A1 horizons. The Typic Cryaquoll is adjacent to Johnson Creek and has thin coarse textured depositional strata.

Ground water levels range from 15 to 80 cm. The shallowest ground water level is accompanied by a gleyed subsoil (WC-11) and the buried 01 horizon. The other two soils are strongly mottled throughout.

Erosion potential of these soils is moderate, and premeability ranges from very slow to rapid. More work is necessary before statements concerning site-vegetation relationships are made.

## Salix drummondiana - Salix rigida/Equisetum arvense

SADR - SARI/EQAR

Drummond Willow - Yellow Willow/Horse Tail

LOCATION: This ct was sampled in the Centennial Mountains. While not observed on the South Fork Salmon, we did not visit much likely habitat in that area. It may be expected on some of the smaller creeks which feed the Salmon. Middle Fork and upper Salmon MIPE stands and Grey's River SABO/MIPE are similar to this type and may be a subset of it.

VEGETATION AND PHYSIOGNOMY: In this ct a medium height willow population dominates a vigorous forb understory. Salix drummondiana, Salix rigida and occasionally S. myrtilifollia or S. barclay combine to give at least 50% cover. Shrub heights vary from 8 to 20 dm but appear generally shorter than other types of S. drummondiana or S. myrtillifolia dominated communities.

Intershrub and some under shrub areas are filled with herbs rich in species and heights. Equisetum arvense does not necessarily visually dominate the stands but is usually abundant. Other characteristics herbs are Senecio triangularis, Saxifraga arguta, Actae rubra and Mitella pentandra.

HABITAT: Stands are gently sloping (to 5%) sites in narrow canyons. The communities occupy small bottomlands adjacent to the creeks. In early August most sites were 35 to 100 cm above the creek level with straight cut or overhung banks. All sites were probably inundated during spring runnoff. Only one site was still being washed with water. BT-2 occupies a small bottom with a spreading drainage. A logging road may have recently diverted the creek flow.

Most sites have irregular topography with hills, fallen rotting logs and some channels. Regular hummocking is not evident under shrubs. Microtopography of sites is probably influenced mostly from outside the community i.e., the adjacent forest, and major changes in water flow.

SOILS: Two Cequic Cryofluvents, three Cumulic Cryaquolls, two Typic Cryaquents, one Aquic Cryorthent and a Terric Borohemist were encountered supporting this community type. Although classified differently these soils have similar properties. First, the surface horizons

of the soils are loamy or coarser. Seven out of nine soils are coarse textured throughout and strongly mottled below the surface horizon.

Several buried A1 and 02 horizons attest to periodical depositional surges. Lithologic discontinuities are common. Coarse textures and moderate inclinations preclude the presence of stagnant surface water. In most profiles, mottling is absent from the surface horizon. It appears that during most years, these soils are completely submerged only during short periods of time. During most of the summer water is present in the profile but below the surface, providing plants with a thin aerated layer.

Permeability is rapid to very rapid and water moves laterally through the profiles. Erosion potential is low to moderate due to coarse textured surface horizons.

ADJACENT COMMUNITIES: Small areas of CARO meadows or willow dominated stands may be adjacent but Abies and Picea overstory uplands are most frequently adjacent in the narrow canyon locations. Forest understories include Thalictrum, Equisetum and Vaccinium.

DISTURBANCE AND MANAGEMENT: Willows and Cornus in several of the stands had been browsed heavily in previous years. Understories did not appear to be grazed or trampled.

Periodic flooding from spring runoff is the major disturbance of these communities. This flooding contributes to the community's resistence to erosion by adding coarse surface fragments. (Predominance of coarse particles is probably partially due to past erosion of fines).

Salix drummondiana-Salix myrtillifolia/Cornus stolonifera-Tall Forb

SADR-SAMY/COST-TALL FORB

Drummond Willow-Blueberry Willow/Dogwood-Tall Forb

LOCATION: This ct was observed and sampled in the Centennial Mountains. We did not observe this type in the South Fork Salmon area nor do any of Tuhy and Jensen's sites fit the vegetation description.

VEGETATION AND PHYSIOGNOMY: Very dense stands of willow are dominated by Salix drummondiana, S. myrtillifolia or both averaging over 3 m tall. Various other willows may also be present. All stands included a discontinuous to dense low shrub layer including Lonicera involucrata, Ribes lacustre or R. inerme. About half the sites include Cornus stolonifera. All of these occur in Willow Creek (see soils discussion).

The low shrub layer is accompanied by tall forbs of similar height (8-20 dm). Species with high constancy and usually 5-50% cover include Heracleum lanatum, Actae rubra, Urtica dioica, Angelica arguta, Rudbeckia occidentale and Mertensia ciliata.

Most understories are further enriched with a variety of short herbs occuring in trace amounts. The communities are generally poor in graminoids. Poa palustris may reach 10% coverage where the canopy opens slightly.

HABITAT: Most stands are at lower elevations where valleys widen and stream velocities decrease. Several stands are adjacent to creeks but up to a meter above the summer water level. Stands are frequently cut by deep, dry channels densely overgrown by both willow and short shrub species. Most willows of these stands are mature but not decadent. This ct flourishes in dense, wide willow flats formed where divided drainages once flooded low lying areas.

SOILS: The soils supporting stands including Cornus are coarse and medium textured Typic Cryorthents (1), Typic Cryaquolls (1) and Cumulic Cryaquolls (3). Textures are predominantly loamy sands, sandy loams, light loams and light sandy clay loams. All profiles are near fast flowing streams and periodic floods are reflected by buried A1 horizons and depositional planes. Ground water levels at sampling time were at

least 80 centimeters deep - but mottling in most profiles indicates that these soils are periodically saturated.

Good internal drainage allows the water table to be lowered concurrently with stream levels. In the spring and early summer when the streams are high, the soils are saturated. As the summer progresses the ground water level is lowered. All the sites samples are at least 80 cms above the stream bed. Thus, these soils experience significant fluctuations of the water table.

Soil of stands which do not include Cornus are characterized by substantially finer textured soils and less unstable ground water levels.

With non-Cornus plots the soils are: one Typic Cryaquoll, two Cumulic Cryaquolls and Pachic Cryoborolls. The upper portion of most profiles is fine textured and permeability is moderately to very slow.

In late July, ground water levels ranged from 80 to 120 cm. The shallowest mottles are below 20 cm. In some profiles depositional planes are evident.

The Pachic Cryoboroll (H-1) has a well expressed Cambic horizon whereas in-situ pedogenesis of the other soils is restricted to mottling and the accumulation of organic matter. Deep abandoned channels through most of the sites facilitates soil drainage and ground water fluctuation is significant.

Due to their fine surface textures, these soils have high moisture holding capacity and the capability of lifting ground water. Fluctuations in water table are somewhat buffered by slow permeability.

ADJACENT COMMUNITIES: Where willow flats fill the valleys and meet upland forest types, Abies and Picea dominate. Equisetum arvense, Symphoricarpos and Geranium dominate understories. POPR meadows and Salix myrtillifolia with wide corridors and dry herb understories are also found. MIPE communities may clothe the banks between this ct and the stream.

DISTURBANCE AND MANAGEMENT: Stands of this ct are almost inaccessible. They receive no cattle use and the only browsing observed was several years old. Wildlife may use the edges of these stands where streams or meadows provide access.

The entire understory of these stands is comparable to the dense, mesic forb complement often found directly beneath willows in drier, more open communities. H-1, mentioned before, appears to be in transition from this ct to a SAGE-SAMY/DRY CORRIDOR. Pathways through the community are being opened with the help of cattle and natural decline of willows.

More dry forb species and grasses can survive here.

The inherent erodibility of the soils is moderate to low as is the potential for stream siltation. The main concern is accelerated sloughing of stream banks. While shrubs may be abundant, these communities do not sustain the dense root mats of graminoids to stabilize soils.

## Salix geyeriana - Salix myrtillifolia/Dry Corridor

### SAGE - SAMY/DRY CORRIDOR

### Geyer Willow - Blueberry Willow/Dry corridor

LOCATION: This community type was sampled at lower elevations in the west half of the Centennial Mountains study area. This type was not observed in our South Fork Salmon area. Tuhy and Jensen (1982) have at least one suitable site classified SAGE/CACA and portions of Tuhy's (1981) SAGE/GEMA ct from the Sawtooth Valley would be described here.

VEGETATION AND PHYSIOGNOMY: This marginally riparian type is characterized by clumps of large Salix geyeriana and or S. myrtillifolia separated by mesic to dry herb communities. Beneath the tall willows (30 dm average) is a short shrub - tall herb assemblage including Ribes lacustre (or inerme), Rubus or Rosa spp. and mesic herbs such as, Ligusticum filicinum, Angelica arguta, Rudbeckia occidentalis and Thalictrum occidentale. In exposed areas between willow clumps are rich groups of drier habitat herbs including Geranium viscosissimum, Perideridia gairdneri, Frageria virginiana, Potentilla gracilis and Castilleja miniata. Phleum pratense, Bromus carinatus and Poa pratensis may be abundant and distributed throughout the stands.

In considering this two part community as a single community type, we are actually applying a double standard to our sampling and data analysis. Considering the large size of the willow clumps and corridors which can be several meters wide, we might consider our stands as a mosaic of a willow/tall forb and a mesic meadow. We consider it as a unit because in an earlier stage of development, it probably was more homogeneous.

HABITAT: This ct is found in wide valleys with dynamic water flow histories. Although once within the active flood plain of their creeks, the communities are now somewhat removed. Water tables at these sites varied from 36 to over 100 cm deep in mid summer. These sites were sampled within several days so this variability cannot be attributed to different sampling dates.

The similarity of understories between the sites, in spite of the great variation in ground water level, suggest that when the water table remains at a minimum depth below the surface, the mesic understory can become established. For these species, the limiting factor here seems

to be oxygen. A small change in botanical composition does occur when water becomes less available (COT-1). The establishment of the Salix species probably occurred when these sites were wetter (see SADR-SAMY/CARO-CAAQ). Within this community type many Salix plants are decadent.

SOILS: The Subgroups represented in the sites sampled are Cumulic Cryaquolls and Cumulic Cryoborolls. Surface and subsurface horizons are primarily medium textured and the planes of deposition are often evident. This and the relative position with respect to the streams suggest periodic floods. Lithologic discontinuities are also common.

These sites are imperfectly to moderately well drained. Permeability ranges from slow to moderately rapid.

ADJACENT COMMUNITIES: This community may gradually merge into either dense willow (SADR-SAMY/COST TALL FORB) or mesic meadow (POPR,DECE) stands. Approaching the valley's water course(s) a change to willow with wetter understories (CACA or CARO-CAAQ) is usually made.

DISTURBANCE AND MANAGEMENT: While the study sites had not been grazed in 1982 before sampling, evidence from previous years use was plain. Of all types observed, this is probably the most heavily used for livestock. Dead outer branches and the cone shape of shrubs indicate both browsing and abrasive disturbance by cattle. Both inaccessibility to livestock and more mesic conditions contribute to under-shrub and corridor herbaceous differences.

The origin of these corridors have been attributed to cattle (Tuhy and Jensen, 1982). It is our belief that cattle contribute towards the widening of these corridors but the basic paths are determined by the preferential establishment of Salix spp. along stream channels. This is supported by the fact that these corridors may be elevated with respect to adjacent areas under Salix shrubs.

## Salix myrtillifolia/Poa pratensis

SAMY/POPR

Blueberry Willow/Kentucky Bluegrass

Two samples of this community type were made in the Centennial Mountains. This type was described by Norton et al. (1981) for western Wyoming (SABO/POPR) and Tuhy and Jensen (1982) for the Salmon River area.

While these sites cluster with SAGE-SAMY/DRY CORRIDOR stands based on vegetation, the mesic to dry herbs of the understory are more evenly distributed through the community. This streamside community does not display the great under-and between-shrub differences of the SAGE-SAMY/DRY CORRIDOR ct. One sample site was heavily grazed by late summer.

## Potentilla fruticosa/Danthonia intermedia

### POPR/DAIN

### Shrubby Cinquefoil/Timber Oatgrass

LOCATION: The POFR/DAIN ct was observed and sampled once in the South Fork Salmon area. Several other stands were observed but were not investigated because of a lack of time.

Potentilla fruticosa is not widespread in the area. Most stands were observed in Tyndall Meadow on Johnson Creek, above 6700 feet. Stands occupy toe slopes near the valley edge.

VEGETATION AND PHYSIOGNOMY: When revisited in late summer, plant species at the sample site fit the vegetation composition described by Tuhy and Jensen. June sampling included more wet herbs such as Erythronium and Dodecatheon.

Tuhy and Jensen (1982) include this ct in a wide range of habitats and with a diversity of understories. Without explanation they have combined Tuhy's POFR/DAIN and POFR/POPR and included one site which might be classified as POFR/DECE (Mutz and Graham, 1982). While management requirements of these types may be similar, the diverse understories should be separated where possible.

HABITAT: The stand sampled and others observed were running with surface water in spring and early summer. Rapidly running subsurface water was observed at 5-10 cm. By late summer, these sites were dry. Gravel bottomed channels traversing the sample site and pea gravel over the ground surface suggests rapid movement of large quantities of water in the spring.

## Potentilla fruticosa/Poa pratensis

POFR/POPR

Shrubby Cinquefoil/Kentucky Bluegrass

LOCATION: One sample was made along Miner's Creek in the Centennial Mountains. Other stands were observed in the area but Potentilla did not appear widespread in the Centennials. The authors did not sample this type in the South Fork Salmon area but Tuhy and Jensen sampled 2 stands fitting this ct description. They include these in their POFR/DAIN ct.

VEGETATION AND PHYSIOGNOMY: The single sample of this ct is within a stream side exclosure along Miner's Creek. A low density shrub component (3-4 dm) dominates a Poa pratensis understory. Aster chilensis, Senecio cymbalarioides, Potentilla gracilis and Frageria virginiana are principal herbs beneath a good grass cover.

HABITAT: The site sampled and others observed fit Tuhy's (1981) POFR/POPR habitat description. While closer to stream channels than many of his sites, the communities were often situated on terraces above the creek's immediate influence.

ADJACENT COMMUNITIES: Artemisia tridentata spp vaseyana or ARCA communities may be adjacent to POFR/POPR. Tuhy and Jensen also report upland communities including Pinus contorta/Festuca idahoensis or Abies lasiocarpa/Carex rossii.

Various wet communities are found between POFR/POPR and the creek or other water sources. These include Salix wolfii, S. geyeriana or S. myrtillifolia and/or Carex rostrata.

DISTURBANCE AND MANAGEMENT: Most Potentilla fruticosa communities observed in the Centennial Mountains were severely grazed. While shrubs were smaller in the grazed areas, density of Potentilla and clumps of Iris was much greater.

## Artemisia cana ssp viscidula

ARCA

Mountain Silver Sagebrush

LOCATION: Artemisia cana ssp viscidula communities are not common in either study area. Tuhy and Jensen sampled 2 ARCA sites in the Sawtooth Valley area. Although not given an understory designation, they would fit the ARCA/FEID ct descriptions of Tuhy, 1981 and Mutz and Graham 1982. One Artemisia stand was sampled in the Centennial Mountains.

VEGETATION AND PHYSIOGNOMY: The one site sampled can add little to the description of this ct. It is, perhaps more mesic than other examples of the type and does not include Festuca idahoensis. Several of Tuhy's samples also lack the Festuca but none are particularly similar to our site. These authors do not have enough additional data to refine the type as Schlatterer (1972) suggests. Until more samples of A. cana dominated sites are available we suggest using ARCA/FEID for appropriate stands and the more general ARCA for stands without the fescue understory.

HABITAT: Much of the ARCA observed in the Centennials occurs in the wide valley of West Camas Creek in a mosaic with large Salix geyeriana and S. myrtillifolia communities with dry meadow corridors.

An uneven microtopography and small dry channels in this and adjacent areas suggests that this area was once within the active flood plain of West Camas Creek. The area is now over 9 dm above the creek's surface.

DISTURBANCE AND MANAGEMENT: Burrowing is evident in this small stand of Artemisia. Cattle had not yet grazed the area in 1982 but heavy use is likely.

## Pinus contorta/Calamagrostis canadensis

PICO/CACA

Lodgepole Pine/Bluejoint Reedgrass

One sample was taken at the forest edge adjacent to Stolle Meadow. This site clustered with the CACA sites but was the most distinctive in the group. Soils and vegetation data are summarized in the appendix.

The site which included a few wet forbs growing in small channels and depressions seems to fit somewhere between Tuhy's dry phase PICO/CACA - THOC and Steele's ABLA/CACA - CACA.

## MISCELLANEOUS PLOTS

Several one-of-a-kind stands were sampled throughout the study areas. Some were sampled because they appeared to fit in the classification system, others simply to document that they did not. Perhaps they will be useful to a future project.

### STEEP SEEP (SFS - 21)

Wet forb and graminoid dominated seep on steep slopes above the South Fork Salmon River. Severe slumping on unstable slopes.

### POINT BAR (WI - 13)

Very sparsely vegetated sand-gravel bar on inside bend of Willow Creek. This community is flooded at least annually and may be comparable to the variable AGSC - bar ct of Tuhy and Jensen (1982).

### CAREX VESICARIA (SFS - 6)

Small stand dominated by Carex vesicaria. Looks very much like CARO ct but with a higher, drier forb constituent.

### CAREX SCOPULORUM (SFS - 24, TM - 11)

Carex scopulorum dominates both of these middle elevation sites but habitats are quite different. The Tyndall Meadow sites is a seep and may be compared to the C. scopulorum plot (MCK SO) that Tuhy and Jensen (1982) include in their ELPA ct. The other is a rich, moist stream side stand with a water table below 50 cm.

### SALIX MYRTILLIFOLIA/CAREX NEBRASKENSIS (SAMY/CANE) (MC-1,MC-3)

Along Miner's Creek on the western edge of the Centennial Mountains study area Carex nebraskensis became much more prevalent in understories and herbaceous stands. Two very wet sites with over 50% coverage of C. nebraskensis and a S. myrtillifolia or mixed Salix overstory were sampled.

ABIES LASIOCARPA/THALICTRUM OCCIDENTALE (ABLA/THOC) (WI-5)

One site sampled in the Centennial Mountains appears to be a Picea engelmanni dominated seral stage of this habitat type. See Steele et al. (1979) for a description of this type.

ELEOCHARIS PALUSTRIS (STM-1, WC-A-B)

Two herbaceous sites dominated by E. palustris were sampled in the Centennial Mountains. A stand on West Camas Creek looked like a small pond with Muhlenbergia filformis around the edge and Carex rostrata to one side. The other much larger stand formed a mosaic with Carex rostrata at the north end of Stamp Meadow. Incidental species included Aster eatonii, Carex athrostachya and Deschampsia cespitosa. The soils of the Stamp Meadow site were essentially the same as the Carex rostrata substrate nearby. Both were dry and cracked at the surface at the time of sampling in late July.

## DISCUSSION: BUILDING ON RELATIONSHIPS

Previous project reports have discussed community pattern and successional relationships among cts. We add here some thoughts on the new types defined in our 1982 project.

### Miscellaneous Carex Communities

The most important new Carex community is CANE. Carex nebraskensis has been present in other areas but is much more abundant in the Centennial Mountains. We expect the ct to be more widespread in the west side of our study area near I-15. Data are limited and not totally consistent for this ct. Soils evidence and valley bottom locations suggest a tolerant species that can withstand anaerobic conditions but does not need saturated conditions throughout the summer.

In the Miner's Creek area C. nebraskensis may occupy the niche of C. aquatilis and Calamagrostis canadensis in willow stand understories. In herbaceous communities it is still primarily an incidental type.

### Seep Communities

A seep community may be either located within a defined riparian zone or, because of its independent water source, it may be nearly surrounded by non-riparian communities. Normally a seep is associated with at least one other riparian type dependent on the seep's outflow. Seep community types defined for this purpose are: SAWO/SWPE-PEGR, SAEA Group/CASC, MIPE, SABO (SAMY)/MIPE, MISC HERB.

The physical elements required for a seep community are:

1) dependable underground water source reaching the surface or near the surface and

2) slight to steep slope

To maintain the seep vegetation, water must be available throughout the growing season. Moss ground covers and sheltered or north and east facing slopes may help to maintain these areas when water supplies are low. Sufficient slope is necessary to keep aerated water moving through the soil. Mottling of seep soils indicate that although wet throughout the year, these soils are not subjected to long periods of reducing conditions. A flat or nearly flat site may support similar vegetation if lower soil profiles are coarse enough to permit rapid drainage of surface supplied water.

Where slopes are not sufficient, related but essentially different bog communities develop. These include ELPA and CARO. These communities often occupy concave positions. Water does not constantly drain through

these stands. Anaerobic conditions may lead to build-up of organic matter unless the soils are sufficiently dried for part of the year.

With a dependable supply of water, seep communities are not likely to "succeed" to a later stage. Organic matter will continue to accumulate but should not substantially change the communities. If the water supply is diverted, these communities may progress to a variety of mesic cts e.g. SAWO/POPR, SAWO-SAEA/MESIC HERB, SADR-SAMY/CACA.

## Graminoid Swards and Their Tall Willow Counterparts

CARO, CAAQ and CACA communities are similar in several respects. In the "ideal" (sensu Plato) they are tall, dense almost mono typic swards. Each ct departs from the ideal to include varying numbers and amounts of other herbaceous (usually forb) species. All have their counterparts in willow dominated communities.

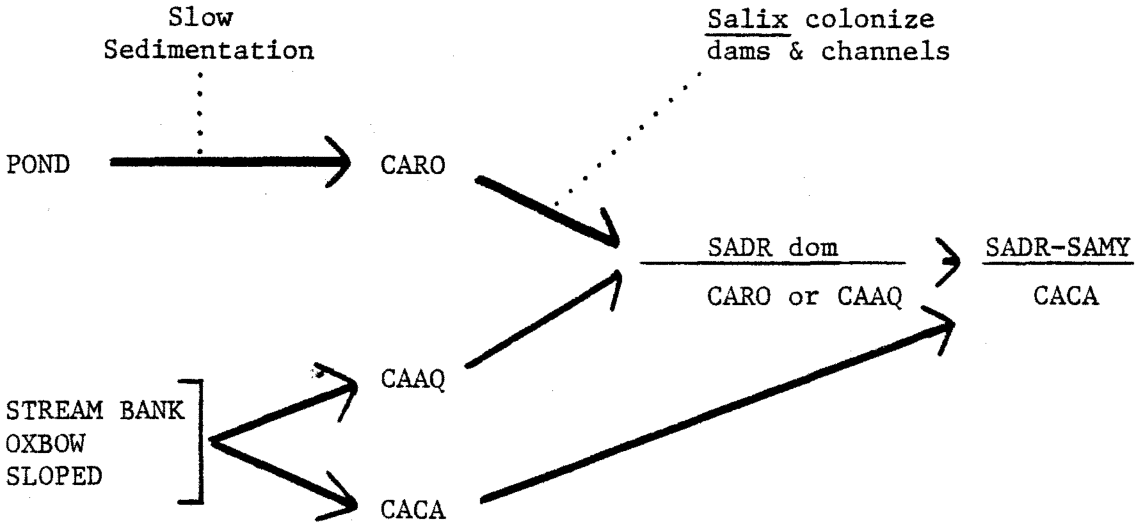
These types should be separated not only based on vegetation characteristics but also habitat. Habitat requirements (or preferences) of CARO and CAAQ are indicated by their valley position and soil development. CARO communities occupy areas where slow moving water has deposited fine textured soils. The environments are relatively stable. Many herbaceous and Salix dominated CARO sites are part of the beaver pond associated communities described by Tuhy and Jensen (1982).

CAAQ cts on the other hand, are associated with more unstable valley positions e.g. adjacent to the South Fork Salmon where spring flooding will periodically deposit sand and debris. Because of their water supplies and coarse subsurface soil textures CAAQ communities may drain below saturation at the surface. A reasonable hypothesis would be that periodic or occasional aeration of Carex aquatilis roots is preferred to the constantly anaerobic conditions C. rostrata endures. CAAQ swards were observed under water throughout the summer (DW-5) but the water constantly flowed through the stand perhaps maintaining aerobic conditions. Carex aquatilis is much more frequently found in SAWO/SWPE-PEGR than is C. rostrata. These soils are also better aerated than the old beaver ponds of CARO.

Less is known of CACA requirements but it's habit is more akin to Carex aquatilis than to C. rostrata. It is understory to all types of willows from Salix wolfii (see SAWO-SAEA/MESIC HERB) to S. geyeriana. Calamagrostis occupies a wide spectrum of habitats.
growing in several centimeters of water and as an understory to forest habitat types. Most commonly it is in mesic rather than wet environments. Calamagrostis is mixed in CAAQ on the South Fork Salmon and in abundance in SALIX/CARO communities (Tuhy and Jensen, 1982). On the other hand Carex rostrata and C. aquatilis are infrequently and sparsely found in their CACA understory communities. We infer that CACA may

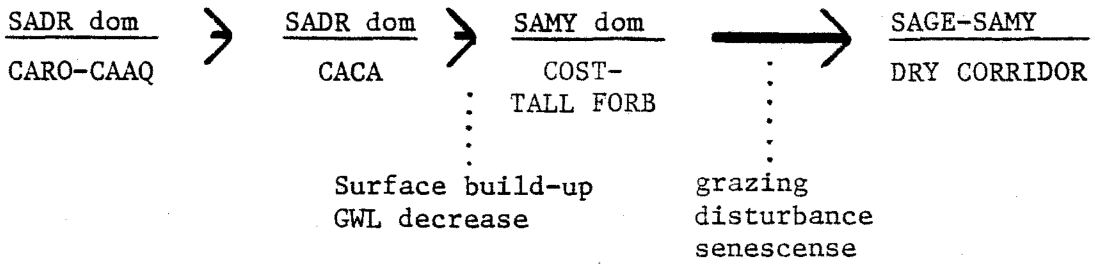
begin to replace (i.e. become abundant in) CARO-CAAQ understories while the communities are quite wet. The Carices do not, however, maintain themselves in the appreciably drier SADR-SAMY/CACA and SAGE/CACA communities.

Communities described above may be related temporally:



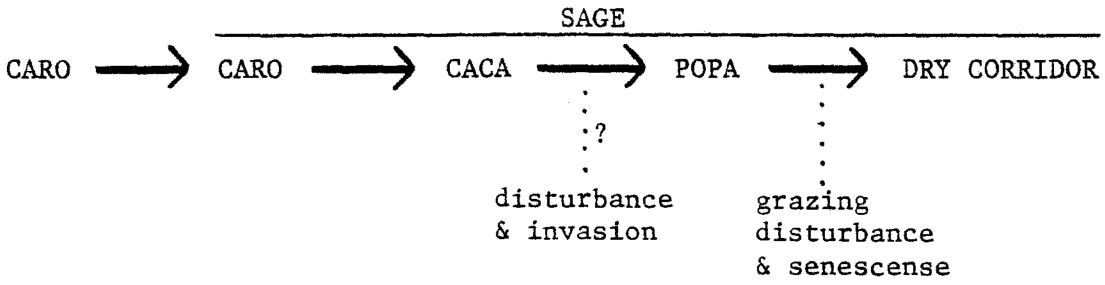

Succession Continues

Several forces can combine to change the willow thicket which we developed in the previous diagram. Willow bosques become more dense with age, ground water levels lower. Tall forbs and Cornus can compete in the shade and drier soil conditions. Many of these communities are mature but not senescent. Canopies are opened by grazing disturbance and decline of willows with further drying. The SAGE-SAMY/DRY CORRIDOR ct may develop.



Other Tall Willows

The Salix geyeriana/Poa palustris ct is a mesic type with habitat characteristics approximating SAGE/CACA. Poa palustris is an introduced species and may be invading Calamagrostis habitat. Tuhy and Jensen (1982) make a similar argument for Deschampsia vs. Poa pratensis in meadows. A combination of primary and secondary succession may proceed:




SAGE/CARO is an uncommon ct; "skipping" seral stages is certainly a possibility.

Short Willow

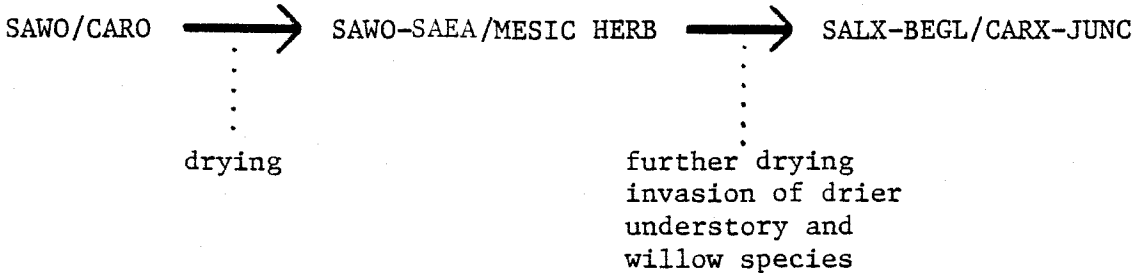
Salix wolfii, S. eastwoodiae, S. phylicifolia and Betula glandulosa are all described with a Carex rostrata and/or C. aquatilis understory. In each type, one or more of the other shrubs may be present or even codominant. Salix wolfii and Betula are combined into a single type since Betula is infrequently the only dominant shrub and is frequently codominant with S. wolfii both in Idaho and Wyoming.

With Salix wolfii, Betula or S. phylicifolia understories are usually Carex rostrata dominated or a mixture. Carex aquatilis is seldom dominant. As described previously, both cts have soils with organic surface horizons. Salix eastwoodiae stands do not have this same OM layer and are frequently underlain by coarse textured soils. Carex aquatilis often dominates these understories.

Based on vegetation, soils and other environmental data, SAWO-BEGL/CARO-CAAQ and SAPH/CARO-CAAQ could be combined into a single ct. Both vegetation and soils data suggest that SAEA is more distinctive. A more useful grouping might be a SHORT SALIX/CARO and a SHORT SALIX/CAAQ. Such a combination recognizes the value differences and habitat preferences of C. aquatilis vs. C. rostrata.

Succession in this short willow system generally proceeds to drier understories with the willow overstory maintained. We have recommended a general/MESIC HERB ct for SAWO dominated stands since understories are

variable for the available samples. Dominant species which have been (or may be) used to name these mesic types are CAMI, POPR and CACA. Similarly diverse understories and mixed shrub overstories are grouped under SALX-BEGL/CARX-JUNC. The latter ct, which often includes tall willow species too, may be a later stage in a given site's development.




Mesic to Dry Meadows

The mesic to dry graminoid meadows (DECE, POPR, ASIN-FEID, JUBA and MESIC GRAM MEAD) are mid to late stages in the progression from aquatic to upland vegetation. At these stages, in-situ development is dominant. Organic matter accumulation and mineralization and movement of substances within the profile are much more important to their community development than the exterior forces such as deposition by flooding or constant flow of water through layers in the soil. Previous importance of these external forces is often evident in the deeper horizons of the soils.

Field testing or mapping the mesic meadows portion of a classification system certainly tests ones loyalties to the Association vs. Continuum school of vegetation study. For practical purposes, most of these types can be grouped. Willow stands and almost all wet types offer obstructions to travel either because of shrub height or unstable substrate. But these meadows are almost mono-typic in relation to access. The exception is early spring when DECE or some of the MESIC GRAM MEADOWS may be susceptible to trampling.

Species composition differences can be important for grazing management but grazing scheduling cannot distinguish small areas of meadow when livestock are in open range. The importance of distinguishing types and drawing even arbitrary boundaries will depend on the reason for the classification and the sensitivity of the managed entity. If conservative management is the intention one may only need to identify the ct most sensitive to damage, assess its location in relation to other resources, e.g., spawning streams, and manage the entire meadow such that the sensitive areas will not be disrupted.

## RECONNAISSANCE OF BOISE AND PAYETTE RIVERS

When field sampling was complete, reconnaissance was made of the Middle and North Fork of the Boise River and the South Fork Payette River in the Boise National Forest of Idaho. An effort was made to determine whether or not the riparian classification system developed to date could adequately describe vegetation of these areas.

The Middle Fork Boise River and some tributaries were observed from Arrowrock Reservoir to the border of the Sawtooth Wilderness Area above Atlanta. At the lower elevations the River is a narrow steep sided canyon. Banks of the river are either rocky or support a narrow zone of riparian vegetation. ALNU-COST and similar stringer communities with Salix lasiandra, Populus angustifolia, Prunus virginiana and Acer glabrum occupy the steep slopes. Small side drainages with intermittent creeks are choked with tree species listed above plus Crataegus and Betula occidentalis. Occasional gravel bars fit the broad AGSC-sandbar and SAEX/POPR or SAEX misc. cts.

Middle reaches of the River and Swanholm Creek support a few wider riparian areas classified as SADR-SAMY/COST-TALL FORB and ALNU-COST. Most of the upper Middle Fork has been dredged for placer gold. The riparian zone is reduced to piles of boulders.

Riparian vegetation is much more abundant along the North Fork Boise River from Swanholm Creek down to Black Rock Campground. Alnus incana and Cornus stolonifera continue to be important with Populus angustifolia and Salix scouleriana interspersed if not dominant.

Rocky bars are more numerous in and on the shoreline of the North Fork. Salix exigua and S. lasiandra are common as is Carex lenticularis. Large sandy flood plains with Populus, S. myrtillifolia and BROMUS-STOC were observed above Barber Flat. Calamagrostis canadensis is prominent in meadows and understories (SADR-SAMY/CACA) along the River and along small creeks between the North Fork Boise and South Fork Payette Rivers and from Idaho City to Lowman. Alnus incana is sometimes interspersed with SADR-SAMY/CACA in this latter area or is abundant with Salix lasiandra and Cornus.

The South Fork Payette River is similar to the Middle Fork Boise with steep rocky side slopes. Crataegus, Amelanchier, Philadelphus and Cornus are abundant. Salix amygdaloides and S. scouleriana are more abundant than S. lasiandra.

Tree dominated areas give way to CARO, ELPA and a few wet forb and Carex communities (MIPE?) in the Grand Jean area.

Based on the small proportion of the area observed, the Boise - Payette area lacks the diversity of riparian vegetation types found in other

parts of Idaho and in Wyoming. Of the three rivers, the North Fork Boise has some potential for more precisely defining the early succession stream bars and shorelines treated by Tuhy and Jensen (1982). The lower river reaches are also lower than any of the project areas to date. Some sampling of the tree dominated stands in this 3000-4500 ft. elevation range would be useful.

## RECOMMENDATIONS FOR INTERMOUNTAIN REGION RIPARIAN PROGRAM

With four years of sampling in Idaho, Utah and Wyoming completed, we feel it is time to change the emphasis of this riparian classification program.

1. Necessarily, much effort has been spent sampling and defining the major cts. This season we abandoned the practice of sampling large numbers of sites in cts which had already been defined. While presence of defined types should be recorded in future study areas, time should not be spent sampling even a token number of these cts. In the Centennial Mountains and South Fork Salmon, we did not have sufficient time to adequately sample new types because of time spent documenting numerous old types. Documented reconnaissance procedures used in the Wyoming Range (Mutz and Graham, 1982) should be considered for future projects.

Judgement must be used, of course, to expand the understanding of types that have been defined but that are poorly understood. Our SAEA Group/ CASC, CANE and CACA sites are good examples of cts which need additional work.

2. Now that several isolated areas have been sampled, we can begin to pool the available data to make some regional generalizations on riparian communities. We attempted this in a small way by using sample plots from previous studies to supplement our descriptions of new community types. Much more could be done with existing data sets particularly in the following areas:

Mesic meadows - POPR, DECE and MESIC GRAM MEAD

Dry meadows - ASIN-FEID, BROMUS-STOC

Mesic Salix - SAWO/CAMI, SAWO/POPR, SAWO-SAEA/MESIC HERB, SALX/CARX-JUNC

3. Lower elevation area(s) should be sampled. These tree dominated communities have been mentioned as incidental communities but require at least limited sampling.

4. Assistance from various disciplines within the Forest Service should be enlisted to develop functional groupings of cts for various management purposes. These should include livestock and big game and non-game wildlife management, fisheries habitat maintenance or improvement, recreation and watershed protection.

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# APPENDIX A

## Riparian Zone Plant Species

BETULACEAE
- Alnus incana
- Alnus sinuata
- Betula glandulosa

BORAGINACEAE
- Hackelia floribunda
- Mertensia ciliata
- Mertensia companulata

CAPRIFOLIACEAE
- Lonicera caerulea
- Lonicera involucrata
- Lonicera utahensis
- Sambucus racemosa
- Symphoricarpos oreophilus

CARYOPHYLLACEAE
- Arenaria longifolia
- Cerastim nutans
- Silene menziesii
- Stellaria longipes

CELASTRACEAE
- Pachystima myrsinites

COMPOSITAE
- Achillea millefolium
- Agoseris glauca
- Antennaria anaphaloides
- Antennaria corymbosa
- Antennaria racemosa
- Antennaria rosea
- Arnica chamissonis
- Arnica cordifolia
- Artemisia cana ssp. viscidula
- Artemisia ludoviciana
- Artemisia tridentata ssp. vaseyana
- Aster chilensis
- Aster eatonii
- Aster foliaceus
- Aster integrifolius
- Aster modestus
- Aster occidentalis
- Cirsium sp.
- Erigeron coulteri
- Erigeron peregrinus
- Hieracium albiflorum
- Rydbergia occidentale

COMPOSITAE (cont'd)
- Senecio crassulus
- Senecio cymbalarioides
- Senecio foetidus
- Senecio hydrophyllus
- Senecio indecorus
- Senecio integerrimus
- Senecio pseudaureus
- Senecio serra
- Senecio sphaerocephalus
- Senecio subnuda
- Senecio triangularis
- Solidago canadensis
- Taraxacum officinale
- Wyethia amplexicaulis
- Wyethia helinanthoides

CORNACEAE
- Cornus stolonifera

CRUCIFERAE
- Arabis sp.
- Descurainea richardsonii
- Draba sp.
- Rorippa curvisilique
- Rorippa islandica

CYPERACEAE
- Carex aquatilis
- Carex athrostachya
- Carex aurea
- Carex buxbaumii
- Carex canescens
- Carex crawfordii
- Carex cusickii
- Carex dioica
- Carex disperma
- Carex douglasii
- Carex hoodii
- Carex illota
- Carex jonesii
- Carex lanuginosa
- Carex lenticularis
- Carex leporinella
- Carex luzulina
- Carex microptera
- Carex muricata
- Carex nebraskensis

CYPERACEAE (cont'd)
- Carex neurophora
- Carex obovoidea
- Carex pachystachya
- Carex praegracilis
- Carex praticola
- Carex raynoldsii
- Carex rossii
- Carex rostrata
- Carex saxatilis
- Carex scopulorum
- Carex simulata
- Eleocharis palustris
- Eleocharis pauciflora
- Scirpus cespitosus

ELAEAGNACEAE
- Sheperdia canadensis

EQUISETACEAE
- Equisetum arvense
- Equisetum hyemale
- Equisetum laevigatum

ERICACEAE
- Arctostaphylos uva-ursi
- Cassiope mertensiana
- Ledum glandulosum
- Menziesia feruginea
- Pyrola asarifolia
- Pyrola secunda
- Pyrola uniflora
- Vaccinium occidentale
- Vaccinium scoparium

FUMARIACEAE
- Corydalis caseana var. cusickii

GENTIANACEAE
- Gentiana affinis
- Gentiana calycosa
- Gentiana simplex
- Swertia perennis

GERANIACEAE
- Geranium richardsonia
- Geranium viscossisimum

GRAMINEAE
- Agropyron caninum
- Agrostis humilis
- Agrostis scabra

GRAMINEAE (cont'd)
- Agrostis thurberiana
- Alopecurus alpinus
- Bromus carinatus
- Bromus ciliatus
- Bromus inermis
- Calamagrostis canadensis
- Calamagrostis inexpansa
- Dactylis glomerata
- Danthonia californica
- Danthonia intermedia
- Deschampsia cespitosa
- Deschampsia elongata
- Elymus glaucus
- Festuca idahoensis
- Festuca occidentale
- Glyceria striata
- Hierochloe odorata
- Hordeum brachyantherum
- Koeleria cristata
- Melica spectabilis
- Muhlenbergia filiformis
- Phalaris arundinacea
- Phleum alpinum
- Phelum pratense
- Poa interior
- Poa leptocoma
- Poa nevadensis
- Poa palustris
- Poa pratensis
- Puccinellia pauciflora
- Stipa occidentalis
- Trisetum spicatum
- Trisetum wolfii

GROSSULARIACEAE
- Ribes hudsonianum
- Ribes inerme
- Ribes lacustre

HYDRANGEACEAE
- Philadelphus lewisii

HYDROPHYLLACEAE
- Hydrophyllum capitatum
- Phacelia sp.

IRIDACEAE
- Iris sp.
- Sisyrinchium angustifolium

JUNCACEAE
- Juncus sp.
- Juncus balticus
- Juncus ensifolius
- Juncus filiformis
- Juncus longistylis
- Juncus regellii
- Juncul traceyi
- Luzula campestris
- Luzula parviflora

LABIATAE
- Agastache urticifolia
- Mentha arvensis

LEGUMINOSAE
- Astragalus alpinus
- Astragalus dasyglottis
- Lupinus lepidus
- Lupinus polyphyllus
- Trifolium eriocephala
- Trifolium longipes
- Trifolium repens

LILIACEAE
- Allium cernuum
- Allium sp.
- Brodiae douglasii
- Calochortus nutallii
- Camassia quamash
- Erythronium grandiflora
- Smilacina racemosa
- Smilacina stellata
- Streptopus amplexifolius
- Tofieldia glutinosa
- Trillium ovatum
- Veratrum viride
- Zigadenus venusta

LINACEAE
- Linum perene

ONAGRACEAE
- Epilobium sp.
- Epilobium angustifolium
- Epilobium glandulosum

OPHIOGLOSSACEAE
- Botrychium sp.

ORCHIDACEAE
- Habenaria hyperborea
- Habenaria saccata
- Spiranthes romanzoffiana

PINACEAE
- Abies lasiocarpa
- Picea engelmannii
- Pinus contorta
- Pseudotsuga menziesii

POLEMONIACEAE
- Collomia linearis
- Phlox longifolia
- Polemonium occidentale

POLYGONACEAE
- Eriogonum umbellatum
- Polygonum bistortoides
- Polygonum douglasii
- Polygonum engelmannii
- Rumex sp.

POLYPODIACEAE
- Athyrium felix-foemina
- Cystopteris fragilis

PORTULACACEAE
- Montia chamossoi
- Montia cordifolia

PRIMULACEAE
- Dodecatheon jeffreyi
- Dodecatheon pauciflorum

RANUNCULACEAE
- Aconitum columbianum
- Actaea rubra
- Aquilegia sp.
- Caltha biflora
- Caltha leptosepala
- Clematis hirsutissima
- Delphinium depauperata
- Delphinium occidentale
- Delphinium pauciflorum
- Ranunculus acris
- Ranunculus acriformis
- Ranunculus alismaefolius
- Ranunculus macounii

RANUNCULACEAE (cont'd)
- Ranunculus orthorhynchus
- Ranunculus uncinatus
- Thalictrum alpinum
- Thalictrum fendleri
- Thalictrum occidentale
- Thalictrum sparsiflorum
- Trautvetteria caroliniensis
- Trollius laxus

RHAMNACEAE
- Ceanothus velutinus
- Rhamnus betuliaefolia

ROSACEAE
- Amelanchier alnifolia
- Crataegus douglasii
- Fragaria virginiana
- Geum macrophyllum
- Geum triflorum
- Physocarpus malvaceus
- Potentilla arguta
- Potentilla anserina
- Potentilla fruticosa
- Potentilla gracilis
- Prunus virginiana
- Prunus vulgaris
- Purshia tridentata
- Rosa sp.
- Rubus parviflorus
- Rubus striata
- Sanguisorba sitchensis
- Sorbus scopulina
- Spiraea densiflora
- Spiraea

RUBIACEAE
- Galium boreale
- Galium trifidum
- Galium triflorum

SALICACEAE
- Populus angustifolia
- Populus tremuloides
- Populus trichocarpa
- Salix amygdaloides
- Salix barclayi
- Salix bebbiana
- Salix commutata
- Salix drummondiana
- Salix eastwoodiae
- Salix exigua
- Salix geyeriana
- Salix lasiandra
- Salix monticola
- Salix myrtillifolia
- Salix phylicifolia
- Salix rigida var. mackenziana
- Salix scouleriana
- Salix wolfii var. idahoensis

SAXIFRAGACEAE
- Mitella pentandra
- Parnassia fimbriata
- Saxifraga arguta
- Saxifraga integrifolia
- Saxifraga oregana

SCROPHULARIACEAE
- Castilleja covillea
- Castilleja cusickii
- Castilleja miniata
- Collinsia parviflora
- Mimulus guttatus
- Mimulus lewisii
- Mimulus primuloides
- Orobanche uniflora
- Pedicularis bracteosa
- Pedicularis groenlandica
- Pedicularis racemosa
- Penstemon albe
- Penstemon globosus
- Penstemon rydbergii
- Veronica americana
- Veronica arvensis
- Veronica scutellata
- Veronica wormskjoldii

SPARGANIACEAE
- Sparganium simplex

UMBELLIFERAE
- Angelica arguta
- Cicuta douglasii
- Heracleum tanatum
- Ligusticum canbyi
- Ligusticum filicinum
- Ligusticum tenuifolium
- Osmorhiza chilensis
- Perideridia bolanderi
- Perideridia gairdneri
- Pseudocymopterus montanus
- Zizia aptera

URTICACEAE
- Urtica dioica

VALERIANACEAE
- Valeriana dioica
- Valeriana edulis
- Valeriana occidentalis
- Valeriana sitchensis

VIOLACEAE
- Viola sp.
- Viola palustris

Appendix B.

Species and Abbreviations Used in Association Tables.

TREES

| | |
|---|---|
| Abie lasi | Abies lasiocarpa |
| Pice engl | Picea engelmannii |
| Pinu cont | Pinus contorta |
| Popu trem | Populus tremuloides |

SHRUBS

| | |
|---|---|
| Alnu inca | Alnus incana |
| Alnu sinu | Alnus sinuata |
| Arte cana | Artemisia cana ssp. viscidula |
| Betu glan | Betula glandulosa |
| Corn stol | Cornus stolonifera |
| Loni caer | Lonicera caerulea |
| Loni invo | Lonicera involucrata |
| Pote frut | Potentilla fruticosa |
| Ribe iner | Ribes inerme |
| Ribe lacu | Ribes lacustre |
| Rosa sp | Rosa species |
| Rubu parv | Rubus parviflorus |
| Salx drum | Salix drummondiana |
| Salx east | Salix eastwoodiae |
| Salx exig | Salix exigua |
| Salx geye | Salix geyeriana |
| Salx lasi | Salix lasiandra |
| Salx mont | Salix monticola |
| Salx myrt | Salix myrtillifolia |
| Salx phyl | Salix phylicifolia |
| Salx rigi | Salix rigida |
| Salx wolf | Salix wolfii var. idahoensis |
| Vacc occi | Vaccinium occidentale |

GRAMINOIDS

| | |
|---|---|
| Agro cani | Agropyron caninum |
| Agrs Scab | Agrostis scabra |
| Agrs thur | Agrostis thurberiana |
| Alop alpi | Alopecurus alpinus |
| Brom cari | Bromus carinatus |
| Brom cili | Bromus ciliatus |
| Cala cana | Calamagrostis canadensis |
| Cala inex | Calamagrostis inexpansa |
| Carx aqua | Carex aquatilis |
| Carx athr | Carx athrostachya |
| Carx buxb | Carex buxbaumii |
| Carx doug | Carex douglasii |

GRAMINOIDS CONT.

| | |
|---|---|
| Carx jone | Carex jonesii |
| Carx lanu | Carex lanuginosa |
| Carx lepo | Carex leporinella |
| Carx luzu | Carex luzulina |
| Carx micr | Carex microptera |
| Carx nebr | Carex nebraskensis |
| Carx neur | Carex neurophora |
| Carx obov | Carex obovoidea |
| Carx rayn | Carex raynoldsii |
| Carx rost | Carex rostrata |
| Carx scop | Carex scopulorum |
| Carx simu | Carex simulata |
| Dant cali | Danthonia californica |
| Cant inte | Danthonia intermedia |
| Desc cesp | Deschampsia cespitosa |
| Desc elon | Deschampsia elongata |
| Eleo palu | Eleocharis palustris |
| Eleo pauc | Elecharis pauciflora |
| Elym glau | Elymus glaucus |
| Fest idah | Festuca idahoensis |
| Glyc stri | Glyceria striata |
| Hord brac | Hordeum brachyantherum |
| Junc balt | Juncus balticus |
| Junc ensi | Juncus ensifolius |
| Junc long | Juncus longifolia |
| Luzu camp | luzula campestre |
| Luzu parv | Luzula parviflora |
| Meli spec | Melica spectabilis |
| Muhl fili | Muhlenbergia filiformis |
| Phle alpi | Phleum alpinum |
| Phle prat | Phleum pratense |
| Poa inte | Poa intermedia |
| Poa palu | Poa palustris |
| Poa prat | Poa pratense |
| Tris wolf | Trisetum wolfii |

FORBS

| | |
|---|---|
| Achi mill | Achillea millefolium |
| Acon colu | Aconitum columbianum |
| Acta rubr | Actae rubra |
| Agos glau | Agoseris glauca |
| Ange argu | Angelica arguta |
| Ante cory | Antennaria corymbosa |
| Ante rose | Antennaria rosea |
| Arni cham | Arnica chamissonis |
| Aste eato | Aster eatonii |
| Aste foli | Aster foliaceus |
| Aste inte | Aster integrifolius |
| Aste mode | Aster modestus |

FORBS CONT.

| | |
|---|---|
| Aste occi | Aster occidentalis |
| Astr alpi | Astragalus alpinus |
| Astr dasy | Astragalus dasyglottis |
| Athy feli | Athyrium felix-foemina |
| Calt bifl | Caltha biflora |
| Cama quam | Camassia quamash |
| Cast covl | Castilleja covillea |
| Cast mini | Castilleja miniata |
| Cicu doug | Cicuta douglasii |
| Cory case | Corydalis caseana var. cusickii |
| Delp occl | Delphinium occidentale |
| Dode jeff | Dodecatheon jeffreyi |
| Epil angu | Epilogium angustifolium |
| Epil glan | Epilobium glandulosum |
| Equi arve | Equisetum arvense |
| Frag virg | Fragaria virginiana |
| Gali bore | Galium boreale |
| Gali trfl | Galium triflorum |
| Gent affi | Gentiana affinis |
| Gera rich | Geranium richardsonia |
| Gera visc | Geranium viscosissimum |
| Geum macr | Geum macrophyllum |
| Habe hype | Habenaria hyperborea |
| Hera lana | Heracleum lanatum |
| Ligu canb | Ligusticum canbyi |
| Ligu fili | Ligusticum filicinum |
| Ligu tenu | Ligusticum tenuifolium |
| Lupi poly | Lupinus polyphyllus |
| Ment arve | Mentha arvensis |
| Mert cili | Mertensia ciliata |
| Mimu gutt | Mimulus guttatus |
| Mimu prim | Mimulus primuloides |
| Mite pent | Mitella pentandra |
| Mont cord | Montia cordifolia |
| Osmo chil | Osmorhiza chilensis |
| Parn fimb | Parnassia fimbriata |
| Pedi groe | Pedicularis groenlandica |
| Pens glob | Penstemon globulare |
| Peri gair | Perideridia gairdneri |
| Pole occi | Polemonium occidentale |
| Poly bist | Polygonum bistortoides |
| Pote gras | Potentilla gracilis |
| Prun vulg | Prunus vulgaris |
| Pyro asar | Pyrola asarifolia |
| Ranu alis | Ranunculus alismaefolius |
| Ranu uncl | Ranunculus uncinatus |
| Rydb occi | Rydbergia occidentalis |
| Sang sitc | Sanguisorba sitchensis |
| Saxi argu | Saxifraga arguta |

FORBS CONT.

| | |
|---|---|
| Saxi oreg | Saxifraga oregana |
| Sene hydr | Senecio hydraphylloides |
| Sene inde | Senecio indecorus |
| Sene inte | Senecio integerrimus |
| Sene pseu | Senecio pseudaureus |
| Sene serr | Senecio serra |
| Sene spha | Senecio sphaerocephala |
| Sene subn | Senecio subnuda |
| Sene tria | Senecio triangularis |
| Smil stel | Smilacina stellata |
| Soli cana | Solidago canadensis |
| Spir dens | Spirea densiflora |
| Spir roma | Spiranthes romanzoffiana |
| Stel long | Stellaria longipes |
| Stre ampl | Steptanthus amplexifolia |
| Swer pere | Swertia perennis |
| Tara offi | Taraxacum officianale |
| Thal fend | Thalictrum fendleri |
| Thal occi | Thalictrum occidentale |
| Trif erio | Trifolium eriocephalum |
| Trif long | Trifolium longifolia |
| Trif repe | Trifolium repens |
| Urti dioi | Urtica dioica |
| Vale occi | Valeriana occidentale |
| Wyet heli | Wyethia helianthoides |
| Zizi apte | Zizia aptera |

| Community Type | Number of Samples | Graminoids Gm/m$^2$ Range ($\bar{X}$) | Forbs Gm/m$^2$ Range ($\bar{X}$) | Total Herb Gm/m$^2$ Range ($\bar{X}$) | Shrubs Gm/m$^2$ Range ($\bar{X}$) |
|---|---|---|---|---|---|
| CARO | 2 | 385-409(397) | 0-1(.5) | 385-410(398) | 0 |
| CAAQ | 3 | 204-842(465) | 0-110(34) | 204-852(499) | 0 |
| ELPAL | 1 | 108 | 70 | 178 | 0 |
| CANE | 3 | 350-397(368) | 0-46(27) | 392-397(395) | 0 |
| MESIC GRAM MEAD | 3 | 38-378(239) | 59-161(125) | 193-437(364) | 0-182(61) |
| DECE | 1 | 203 | 113 | 316 | 0 |
| MECI | 2 | 11-14(13) | 104-408(256) | 115-422(269) | 0-157(78.5) |
| ASIN-FEID | 2 | 81-131(106) | 162-288(225) | 293-369(331) | 0 |
| CACA | 1 | 452 | 9 | 461 | 0 |
| POPR | 1 | 305 | 360 | 665 | 0 |
| SAGE/CACA | 2 | 108-350(229) | 72-151(112) | 180-501(341) | 1620-3108(2314) |
| SAGE/CARO-CAAQ | 3 | 63-464(251) | 27-97(52) | 90-561(303) | 710-2116(1423) |
| SAGE-SAMY/DRY C. | 3 | 49-144(88) | 147-477(289) | 196-621(377) | 597-3088(2115) |
| SAGE/POPA | 2 | 61-89(75) | 116-212(164) | 117-301(239) | 650-3097(1874) |
| SADR-SAMY/CARO-CAAQ | 3 | 85-364(194 | 0-130(55) | 121-364(249) | 1655-3324(2566) |
| SAWO/SWPE-PEGR | 3 | 28-204(114) | 84-153(109) | 181-288(223) | 1531-2059(1709) |
| SAPH/CARO-CAAQ | 3 | 109-312(204) | 0-69(38) | 155-381(242) | 1008-1440(1232) |
| SAWO/MESIC HERB | 3 | 58-131(63) | 151-203(170) | 236-282(233) | 949-3605(2622) |

| Community Type | Number of Samples | Graminoids Gm/m Range ($\bar{X}$) | Forbs Gm/m Range ($\bar{X}$) | Total Herb Gm/m Range ($\bar{X}$) | Shrubs Gm/m Range ($\bar{X}$) |
|---|---|---|---|---|---|
| SALX-BEGL/CARX-JUNC | 2 | 31-63(47) | 69-134(102) | 10-297(149) | 1010-2800(1905) |
| SAEA/CARO-CAAQ | 1 | 279 | 3 | 282 | 630 |
| SAWO-BEGL/CARO-CAAQ | 4 | 139-366(268) | 0-97(41) | 178-366(309) | 1491-2100(1856) |
| SADR-SAMY/COST-TALL FORB | 5 | 0-23(8) | 38-308(155) | 45-308(163) | 2440-10050(5065) |
| SADR-SAMY/CACA | 1 | 158 | 189 | 347 | 952 |
| SADR-SARI/EQAR | 8 | 8-135(103) | 88-265(184) | 162-400(287) | 804-2784(1534) |
| SAMY/POPR | 1 | 45 | 28 | 73 | 2636 |
| ALNU/COST | 2 | 0-16(8) | 90-308(199) | 106-308(207) | 1728-2128(1928) |
| ALSI | 1 | 0 | 49 | 49 | 1038 |
| POFR/POPR | 1 | 188 | 28 | 216 | 396 |

# APPENDIX C

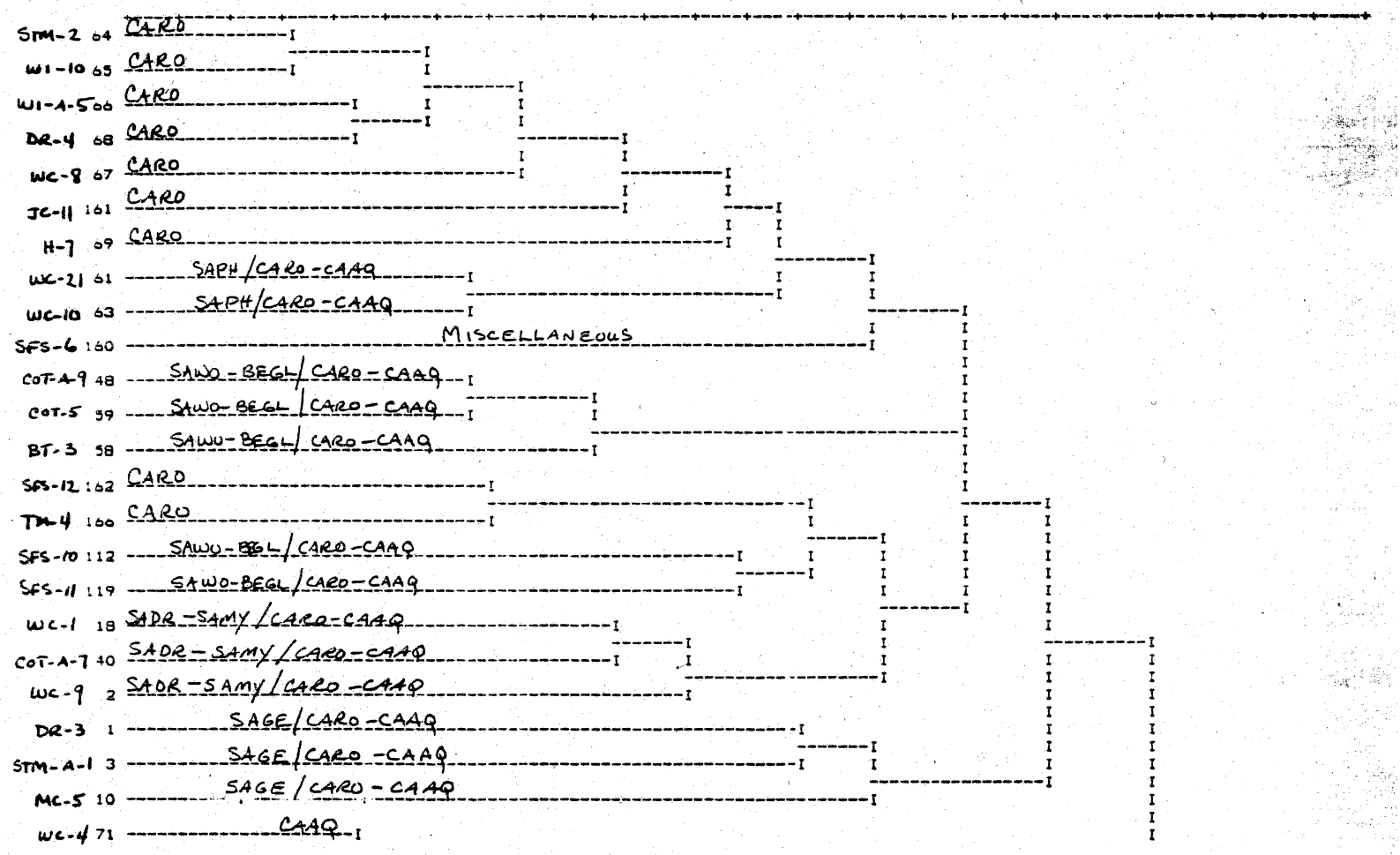
## Dendrograms

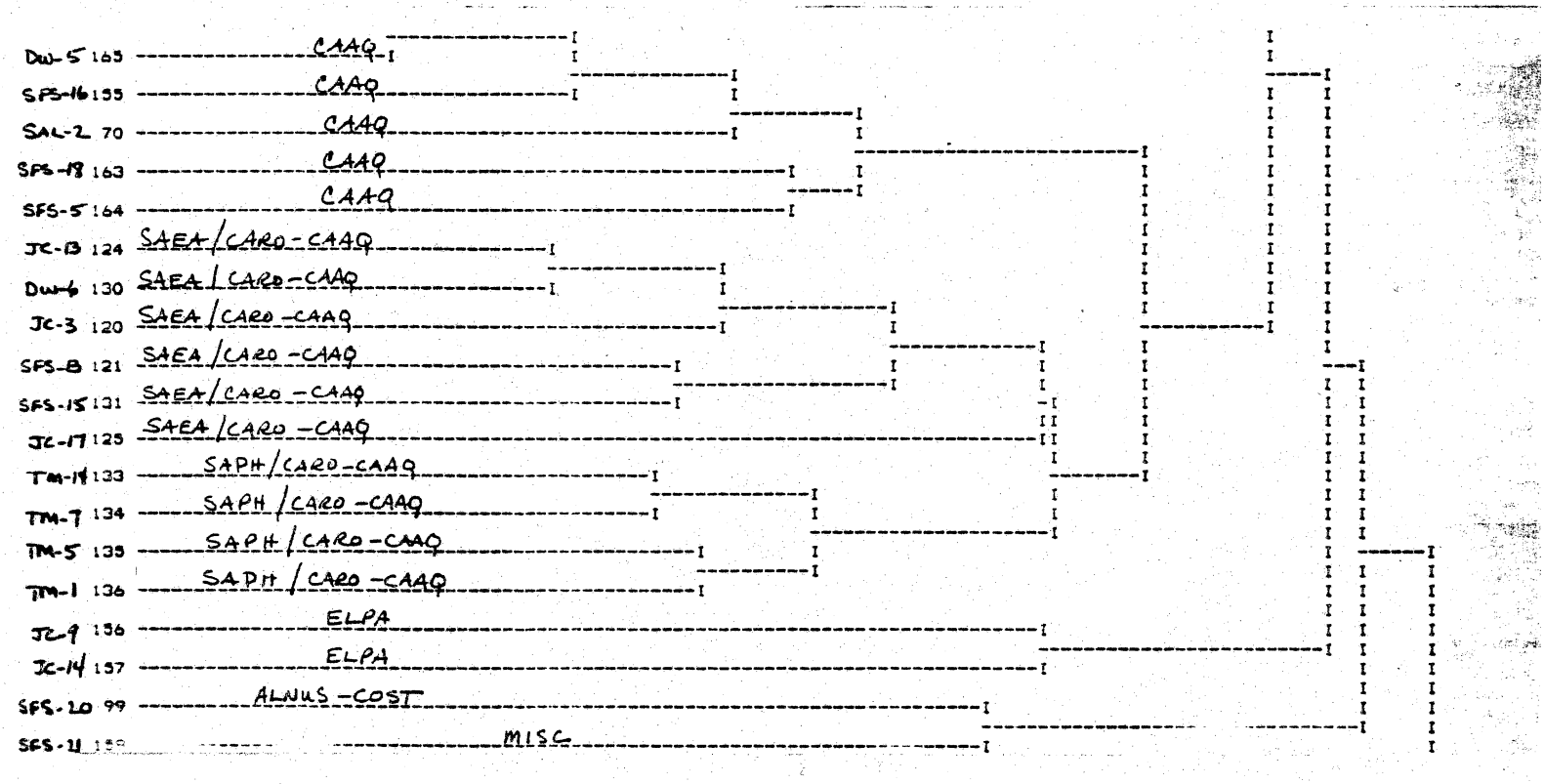
# CLUSTAR : ALL PLOTS

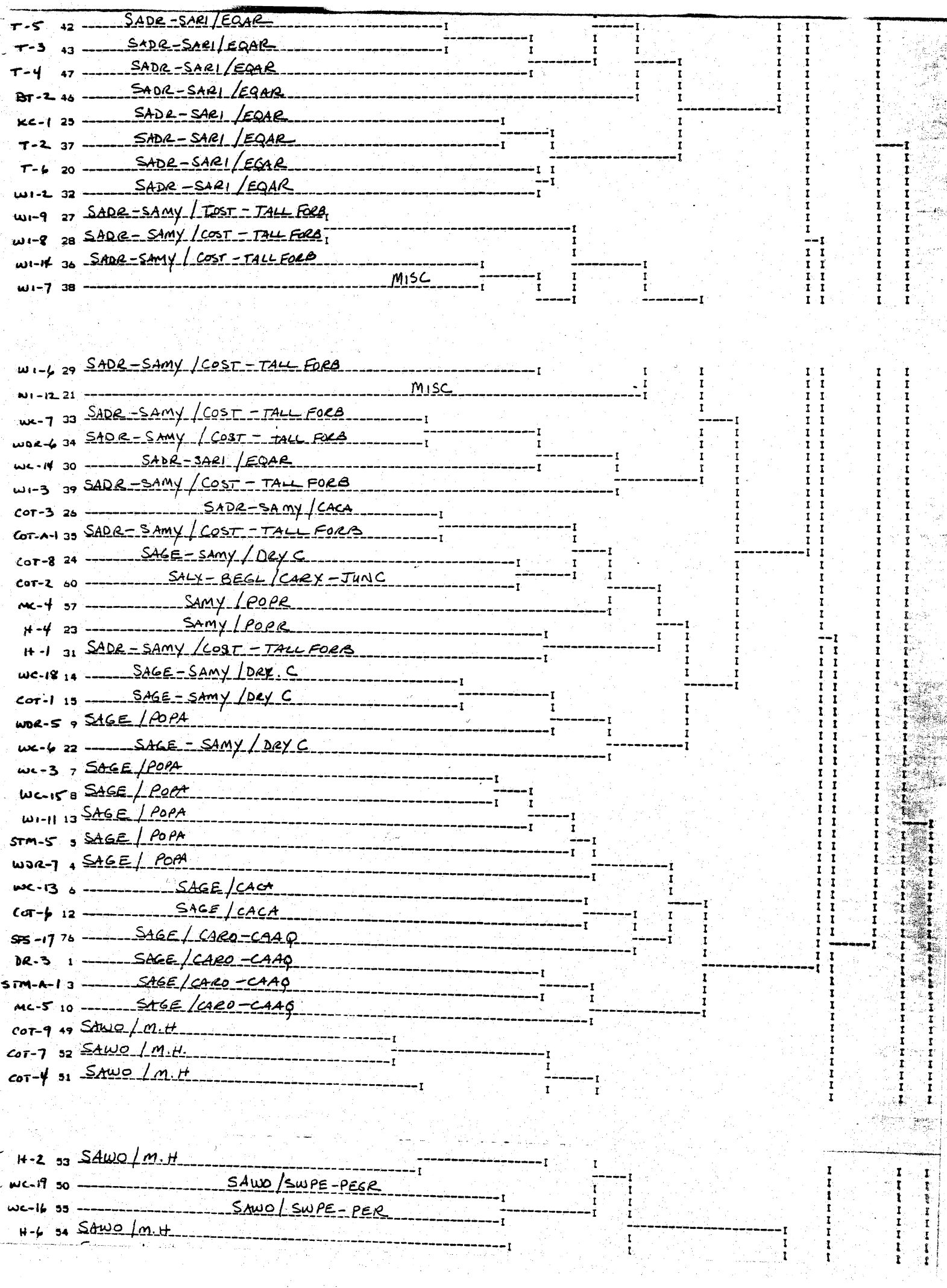
- - - - - - - - TREE - - - - - - - -

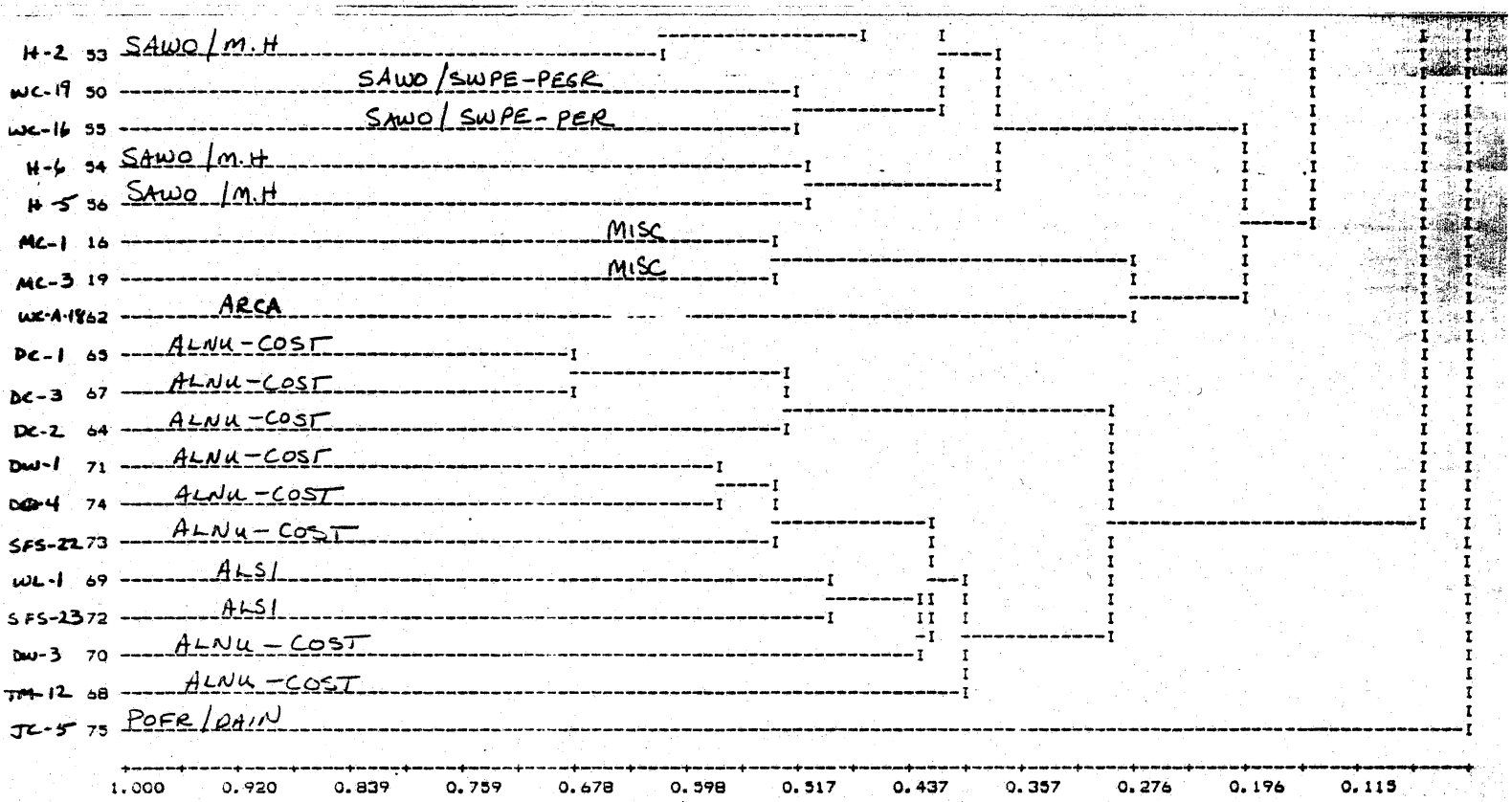
RESEMBLANCE MATRIX NAME : RRIP
TREE NAME : TREE
NODE COUNT OPTION : 0
COPHENETIC OPTION : 0
CLUSTERING METHOD : UPGMA - CAAQ
MINIMUM VALUE ON TREE : 0.0390
MAXIMUM VALUE ON TREE : 1.0000

- - - - - - - - TREE - - - - - - - -




T-5 42 SADR-SARI/EQAR
T-3 43 SADR-SARI/EQAR
T-4 47 SADR-SARI/EQAR
BT-2 46 SADR-SARI/EQAR
KC-1 25 SADR-SARI/EQAR
T-2 37 SADR-SARI/EQAR
T-6 20 SADR-SARI/EQAR
W1-2 32 SADR-SARI/EQAR
W1-9 27 SADR-SAMY/TOST-TALL FORB
W1-8 28 SADR-SAMY/COST-TALL FORB
W1-14 36 SADR-SAMY/COST-TALL FORB
W1-7 38 MISC
W1-6 29 SADR-SAMY/COST-TALL FORB
W1-12 21 MISC
WC-7 33 SADR-SAMY/COST-TALL FORB
WDR-6 34 SADR-SAMY/COST-TALL FORB
WC-14 30 SADR-SARI/EQAR
W1-3 39 SADR-SAMY/COST-TALL FORB
COT-3 26 SADR-SAMY/CACA
COT-A-1 35 SADR-SAMY/COST-TALL FORB
COT-8 24 SAGE-SAMY/DRY C
COT-2 60 SALX-BEGL/CAREX-JUNC
MC-4 57 SAMY/POPR
H-4 23 SAMY/POPR
H-1 31 SADR-SAMY/COST-TALL FORB
WC-18 14 SAGE-SAMY/DRY C
COT-1 15 SAGE-SAMY/DRY C
WDR-5 9 SAGE/POPA
WC-6 22 SAGE-SAMY/DRY C
WC-3 7 SAGE/POPA
WC-15 8 SAGE/POPA
W1-11 13 SAGE/POPA
STM-5 5 SAGE/POPA
WDR-7 4 SAGE/POPA
WC-13 6 SAGE/CACA
COT-6 12 SAGE/CACA
SFS-17 76 SAGE/CARO-CAAQ
DR-3 1 SAGE/CARO-CAAQ
STM-A-1 3 SAGE/CARO-CAAQ
MC-5 10 SAGE/CARO-CAAQ
COT-9 49 SAWO/M.H
COT-7 52 SAWO/M.H
COT-4 51 SAWO/M.H
H-2 53 SAWO/M.H
WC-19 50 SAWO/SWPE-PEGR
WC-16 55 SAWO/SWPE-PER
H-6 54 SAWO/M.H

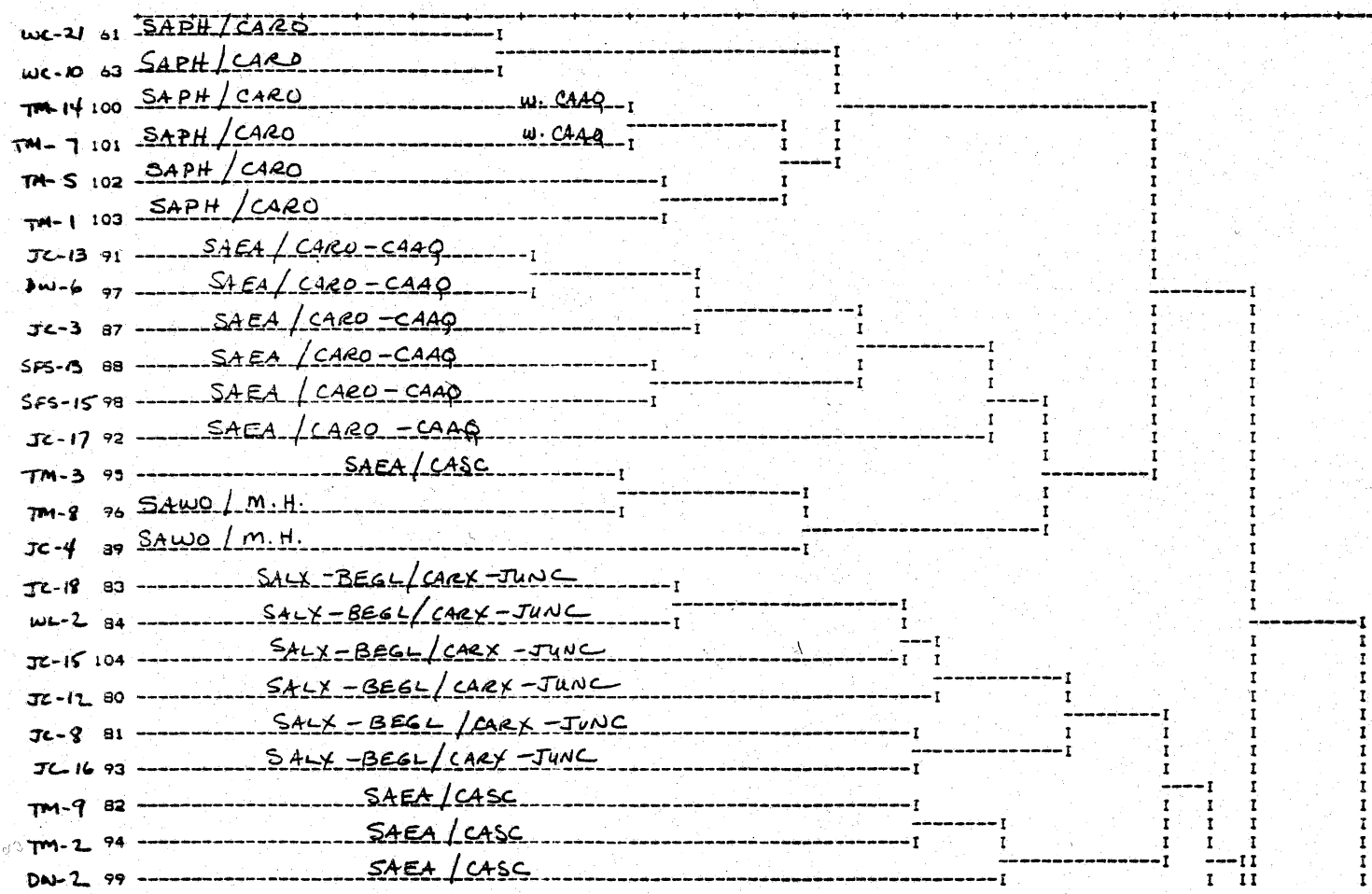

H-2 53 SAWO/M.H
WC-19 50 SAWO/SWPE-PEGR
WC-16 55 SAWO/SWPE-PER
H-6 54 SAWO/M.H
H-5 56 SAWO/M.H
MC-1 16 MISC
MC-3 19 MISC
WC-A-1862 ARCA
DC-1 65 ALNU-COST
DC-3 67 ALNU-COST
DC-2 64 ALNU-COST
DW-1 71 ALNU-COST
DW-4 74 ALNU-COST
SFS-22 73 ALNU-COST
WL-1 69 ALSI
SFS-23 72 ALSI
DW-3 70 ALNU-COST
TM-12 68 ALNU-COST
JC-5 75 POFR/DAIN
1.000 0.920 0.839 0.759 0.678 0.598 0.517 0.437 0.357 0.276 0.196 0.115

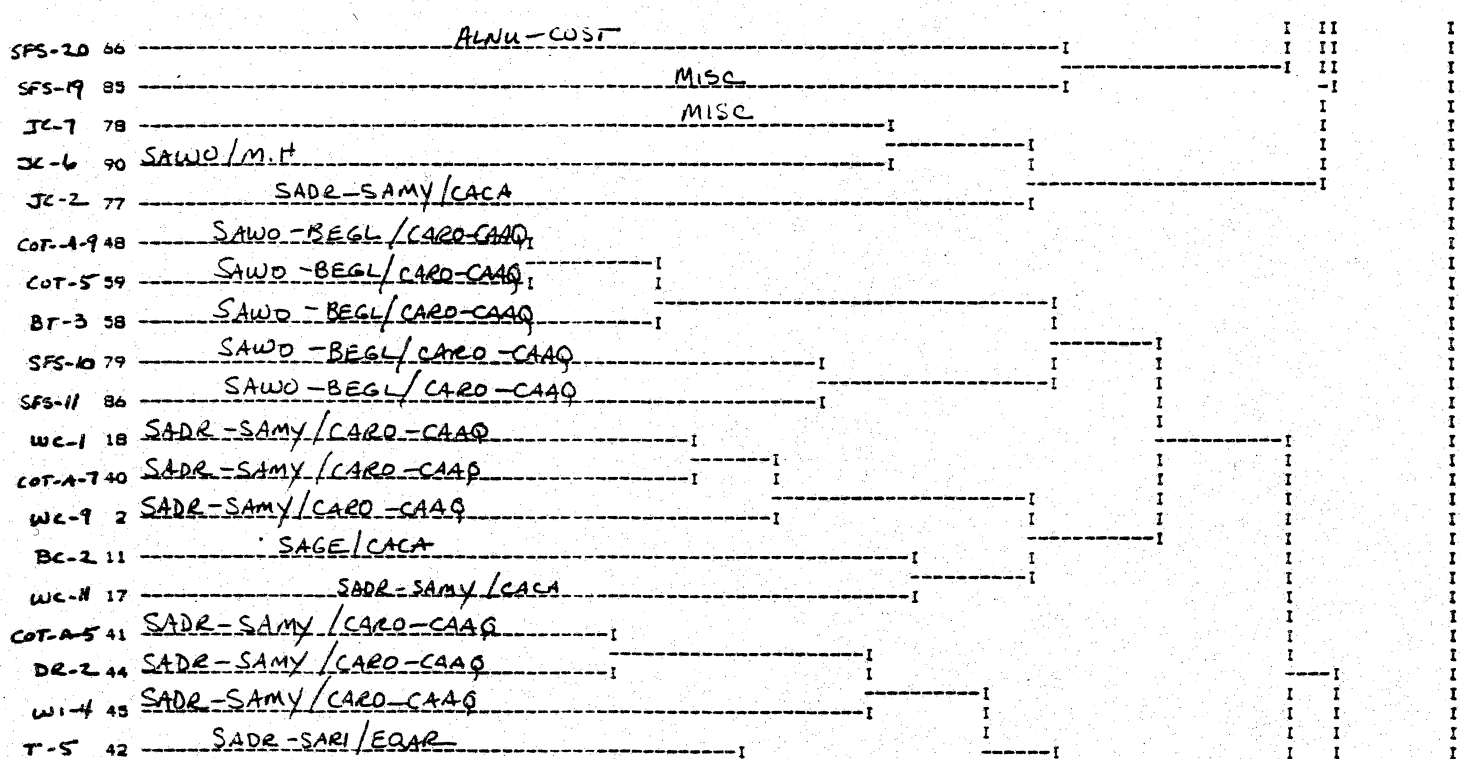
# CLUSTAR: SHRUB PLOTS

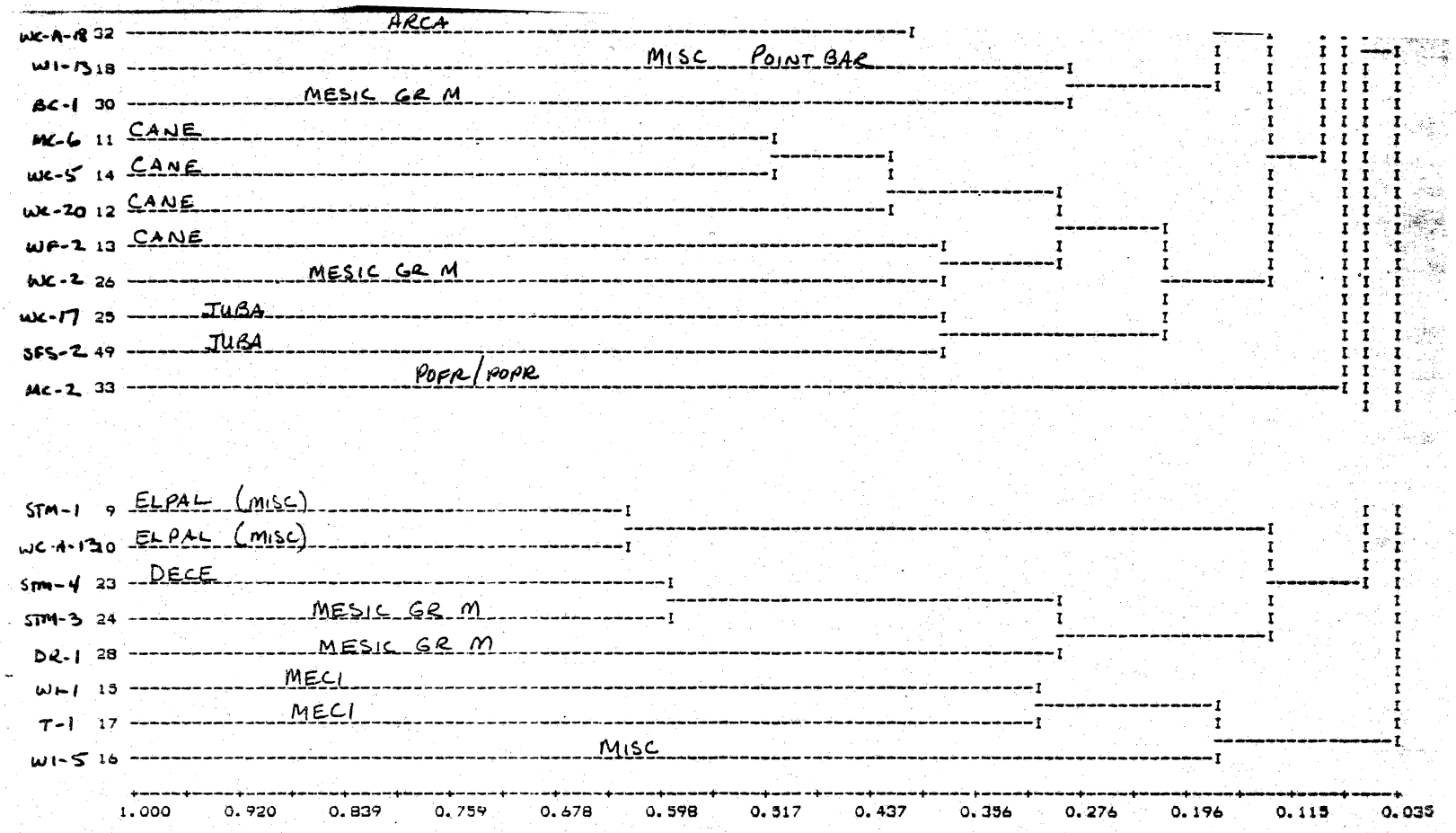
- - - - - - - TREE - - - - - - -

RESEMBLANCE MATRIX NAME : RRIP
TREE NAME : TREE
NODE COUNT OPTION : 0
COPHENETIC OPTION : 0
CLUSTERING METHOD : UPGMA
MINIMUM VALUE ON TREE : 0.0348
MAXIMUM VALUE ON TREE : 1.0000

- - - - - - - TREE - - - - - - -




WC-A-8 32 ARCA
WI-5 18 MISC POINT BAR
BC-1 30 MESIC GR M
MC-6 11 CANE
WC-5 14 CANE
WC-20 12 CANE
WF-2 13 CANE
WC-2 26 MESIC GR M
WC-17 25 JUBA
SFS-2 49 JUBA
MC-2 33 POFR/POPR

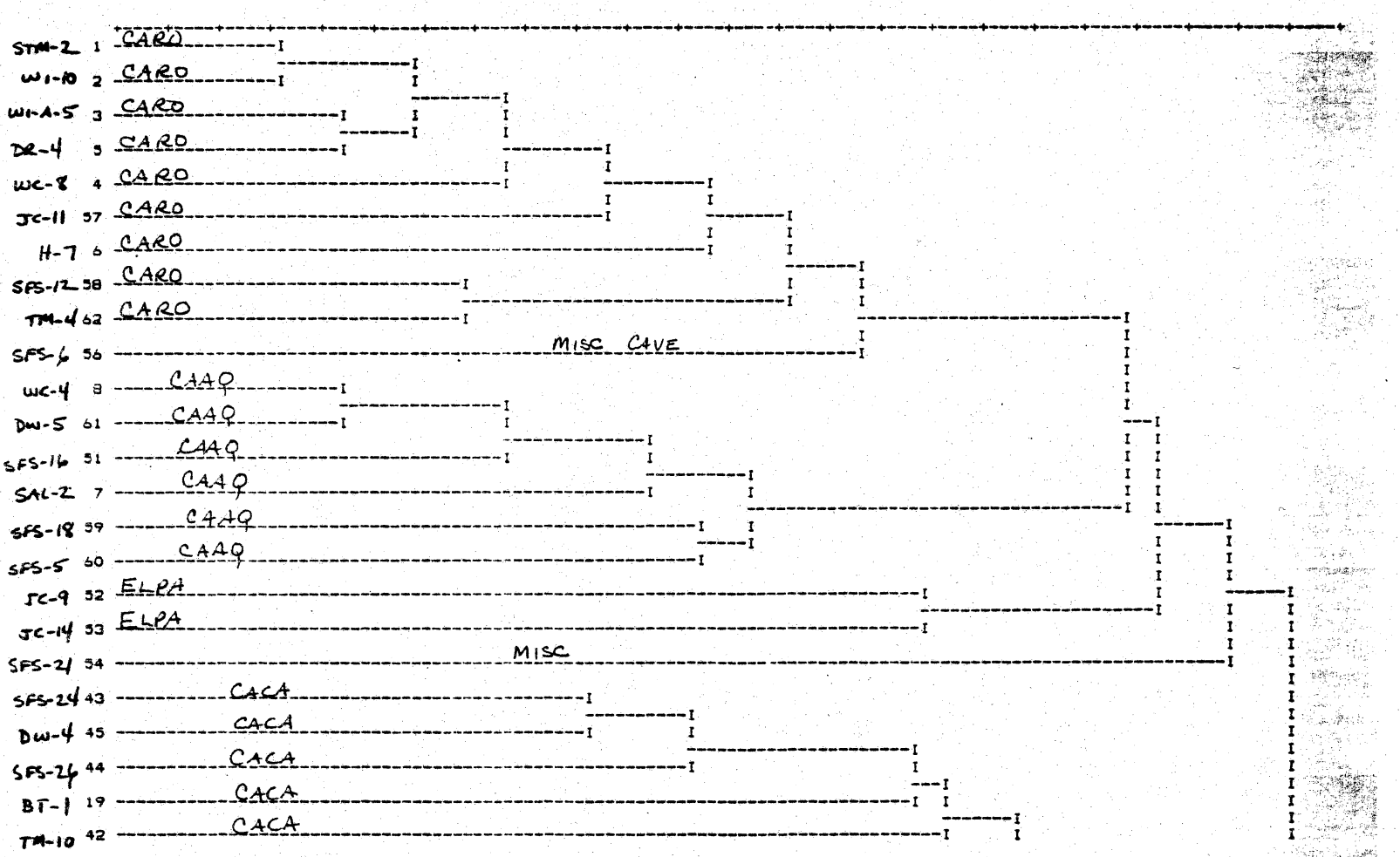

STM-1 9 ELPAL (MISC)
WC-A-13 20 ELPAL (MISC)
STM-4 23 DECE
STM-3 24 MESIC GR M
DR-1 28 MESIC GR M
WI-1 15 MECI
T-1 17 MECI
WI-5 16 MISC
1.000 0.920 0.839 0.759 0.678 0.598 0.517 0.437 0.356 0.276 0.196 0.115 0.035

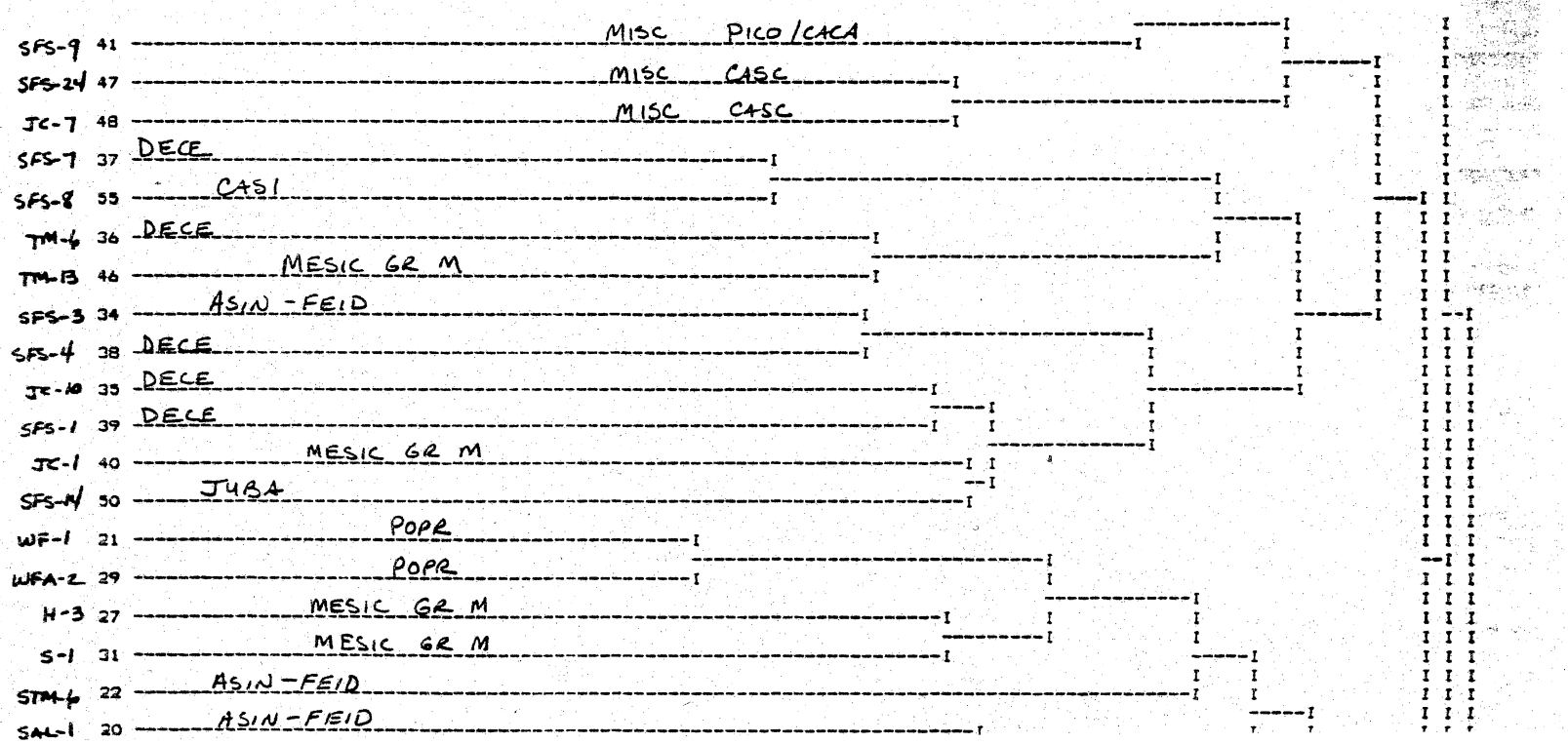
- - - - - - - - TREE - - - - - - - -

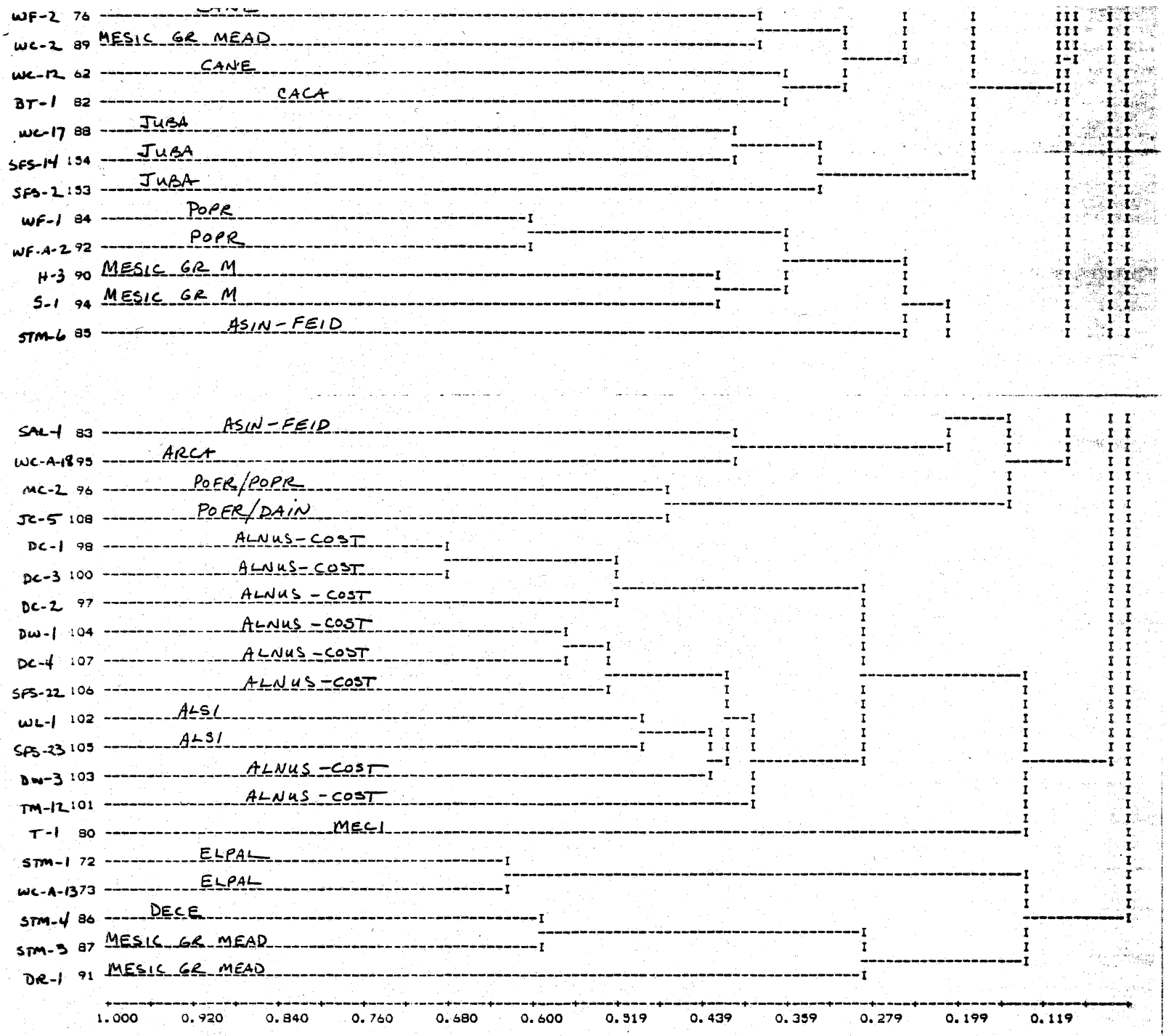
RESEMBLANCE MATRIX NAME : RRIP
TREE NAME : TREE
NODE COUNT OPTION : 0
COPHENETIC OPTION : 0
CLUSTERING METHOD : UPGMA
MINIMUM VALUE ON TREE 0.0347
MAXIMUM VALUE ON TREE 1.0000

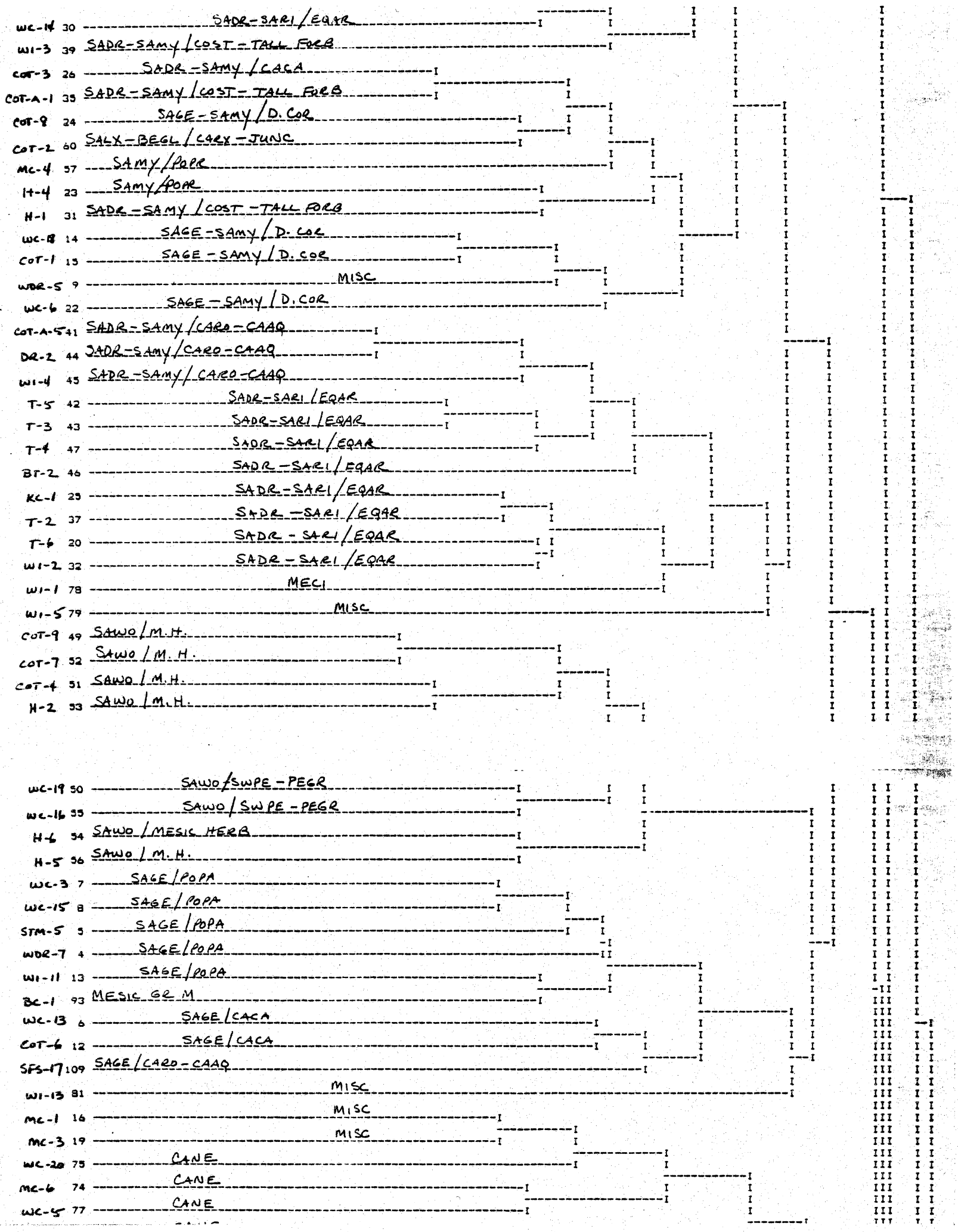
- - - - - - - - TREE - - - - - - - -

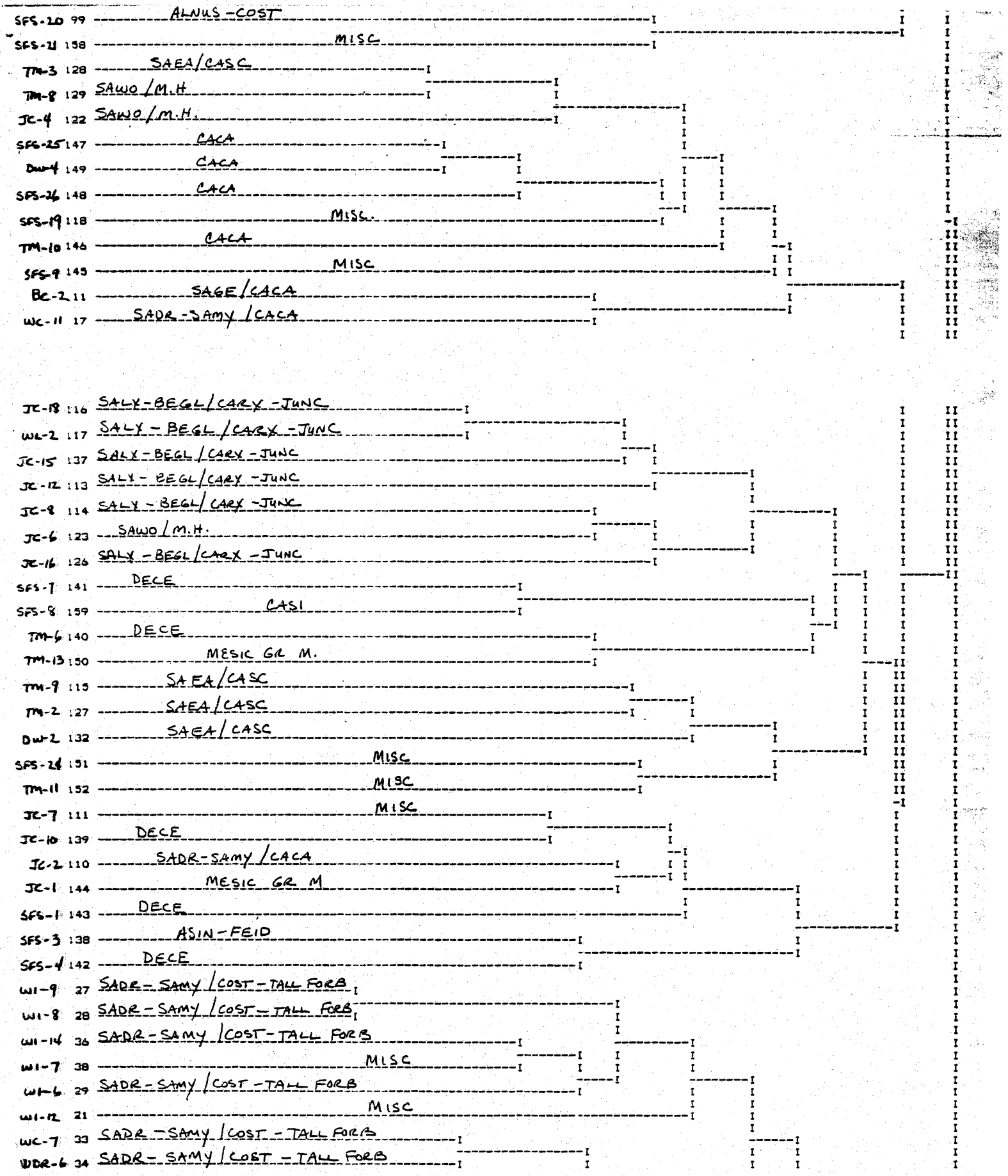
# CLUSTAR HERB PLOTS




WF-2 76
WC-2 89 MESIC GR MEAD
WC-12 62 CANE
BT-1 82 CACA
WC-17 88 JUBA
SFS-14 154 JUBA
SFS-2 153 JUBA
WF-1 84 POPR
WF-A-2 92 POPR
H-3 90 MESIC GR M
S-1 94 MESIC GR M
STM-6 85 ASIN-FEID
SAL-1 83 ASIN-FEID
WC-A-18 95 ARCA
MC-2 96 POFR/POPR
JC-5 108 POFR/DAIN
DC-1 98 ALNUS-COST
DC-3 100 ALNUS-COST
DC-2 97 ALNUS-COST
DW-1 104 ALNUS-COST
DC-4 107 ALNUS-COST
SFS-22 106 ALNUS-COST
WL-1 102 ALSI
SFS-23 105 ALSI
DW-3 103 ALNUS-COST
TM-12 101 ALNUS-COST
T-1 80 MEC1
STM-1 72 ELPAL
WC-A-13 73 ELPAL
STM-4 86 DECE
STM-3 87 MESIC GR MEAD
DR-1 91 MESIC GR MEAD
1.000 0.920 0.840 0.760 0.680 0.600 0.519 0.439 0.359 0.279 0.199 0.119


WC-14 30 SADR-SARI/EQAR
WI-3 39 SADR-SAMY/COST-TALL FORB
COT-3 26 SADR-SAMY/CACA
COT-A-1 35 SADR-SAMY/COST-TALL FORB
COT-8 24 SAGE-SAMY/D.COR
COT-2 60 SALX-BEGL/CAREX-JUNC
MC-4 57 SAMY/POPR
H-4 23 SAMY/POAR
H-1 31 SADR-SAMY/COST-TALL FORB
WC-8 14 SAGE-SAMY/D.COR
COT-1 15 SAGE-SAMY/D.COR
WDR-5 9 MISC
WC-6 22 SAGE-SAMY/D.COR
COT-A-5 41 SADR-SAMY/CARO-CAAQ
DR-2 44 SADR-SAMY/CARO-CAAQ
WI-4 45 SADR-SAMY/CARO-CAAQ
T-5 42 SADR-SARI/EQAR
T-3 43 SADR-SARI/EQAR
T-4 47 SADR-SARI/EQAR
BT-2 46 SADR-SARI/EQAR
KC-1 29 SADR-SARI/EQAR
T-2 37 SADR-SARI/EQAR
T-6 20 SADR-SARI/EQAR
WI-2 32 SADR-SARI/EQAR
WI-1 78 MECI
WI-5 79 MISC
COT-9 49 SAWO/M.H.
COT-7 52 SAWO/M.H.
COT-4 51 SAWO/M.H.
H-2 53 SAWO/M.H.
WC-19 50 SAWO/SWPE-PEGR
WC-16 55 SAWO/SWPE-PEGR
H-6 54 SAWO/MESIC HERB
H-5 56 SAWO/M.H.
WC-3 7 SAGE/POPA
WC-15 8 SAGE/POPA
STM-5 5 SAGE/POPA
WDR-7 4 SAGE/POPA
WI-11 13 SAGE/POPA
BC-1 93 MESIC GR M
WC-13 6 SAGE/CACA
COT-6 12 SAGE/CACA
SFS-17 109 SAGE/CARO-CAAQ
WI-13 81 MISC
MC-1 16 MISC
MC-3 19 MISC
WC-20 75 CANE
MC-6 74 CANE
WC-5 77 CANE


SFS-20 99 ALNUS-COST
SFS-21 158 MISC
TM-3 128 SAEA/CASC
TM-8 129 SAWO/M.H
JC-4 122 SAWO/M.H.
SFS-25 147 CACA
Dw-4 149 CACA
SFS-26 148 CACA
SFS-19 118 MISC.
TM-10 146 CACA
SFS-9 145 MISC
Bc-2 11 SAGE/CACA
WC-11 17 SADR-SAMY/CACA
JC-18 116 SALX-BEGL/CARX-JUNC
WL-2 117 SALX-BEGL/CARX-JUNC
JC-15 137 SALX-BEGL/CARX-JUNC
JC-12 113 SALX-BEGL/CARX-JUNC
JC-8 114 SALX-BEGL/CARX-JUNC
JC-6 123 SAWO/M.H.
JC-16 126 SALX-BEGL/CARX-JUNC
SFS-7 141 DECE
SFS-8 159 CASI
TM-6 140 DECE
TM-13 150 MESIC GR M.
TM-9 115 SAEA/CASC
TM-2 127 SAEA/CASC
Dw-2 132 SAEA/CASC
SFS-24 151 MISC
TM-11 152 MISC
JC-7 111 MISC
JC-10 139 DECE
JC-2 110 SADR-SAMY/CACA
JC-1 144 MESIC GR M
SFS-1 143 DECE
SFS-3 138 ASIN-FEID
SFS-4 142 DECE
WI-9 27 SADR-SAMY/COST-TALL FORB
WI-8 28 SADR-SAMY/COST-TALL FORB
WI-14 36 SADR-SAMY/COST-TALL FORB
WI-7 38 MISC
WI-6 29 SADR-SAMY/COST-TALL FORB
WI-12 21 MISC
WC-7 33 SADR-SAMY/COST-TALL FORB
WDR-6 34 SADR-SAMY/COST-TALL FORB

# APPENDIX E

## Soil Description Summaries

EXPLANATORY FOOTNOTES FOR SUMMARY TABLE
OF SOIL CLASSIFICATION AND DESCRIPTION

(1) Family textural classes: fl = fine-loamy, fsi = fine silty, s = sandy, c = clayey, col = coarse loamy, csi = coarse silty, H = Hemic, ssk - sandy skeletal, lsk - loamy skeletal, csk - clay skeletal, sicl - silty clay loam, sil - silt loam, ls = loamy sand.

(2) Horizon (thickness) texture - % fragments.

| # PLOT | SUB-GROUP | (1) FAMILY | (2) PEDON ABBREVIATION |
|---|---|---|---|
| WC-1 | Cumulic Cryaquoll | c | A11(5)sicl,O(15)f,A12g(80)c |
| WC-2 | Typic Cryaquoll | c | A11(5)sil,A12(17)c,A13g(18)c,IIClg(60)sl-5 |
| WC-3 | Cumulic Cryaquoll | c/l | A11(10)cl,A12(20)c,A13(12)sic,A14g(48)c-5,IIClg(?)sl-5 |
| WC-4 | Cumulic Cryaquoll | c/ssk | A11(10)sicl,A12(10)sic,A13g(70)c,IIC(?)scl-40 |
| WC-5 | Cumulic Cryaquoll | c | A11(10)sicl,A12g(25)c,A13g(30)c,IIClg(35)scl-5 |
| WC-6 | Cumulic Cryaquoll | fl | A11(14)cl,A+c(34)scl,A12b(32)scl,Clg(?)scl |
| WC-7 | Cumulic Cryaquoll | c/s | A11(9)scl,A12(11)cl,A13(35)cl,A14(41)siclIICl(?)s-10 |
| WC-8 | Terric Borohemist | H/sicl | O1(64)H,A1g(?)sicl |
| WC-9 | Terric Borohemist | H/sic | O1(61)H,A1g(?)sic |
| WC-10 | Typic Borohemist | H | O1(100)H |
| WC-11 | Cumulic Cryaquoll | c | A11(10)cl,O1(16)F,A12g(44)c,A13g(?)cl |
| WC-12 | Cumulic Cryaquoll | c | O1(10)H,A11g(20)c,A12g(20)c,C1g(50)c,C2g(?)c |
| WC-13 | Typic Cryaquoll | c | O2(10)H,A11g(14)sic,A12g(16)sic,A13g(15)sic,B2g(20)sic,C1g(35)cl |
| WC-14 | Cumulic Cryaquoll | cl | A11(17)scl,AC1(16)1fs,A12bg(6)scl,AC2(40)1s,IICl(27+)1s-60 |
| WC-15 | Cumulic Cryaquoll | fl | A11(10)1,A12(25)scl,AC1(15)sl-20,A13bg(10)1-10,C1(40+)sl-15 |
| WC-16 | Terric Borohemist | H | O1(5)H,O1(10)H,O12(35)H,O13(40)H,C1(10+)s-40 |
| WC-17 | Typic Cryaquoll | c | O1(5)F,A11g(20)sic,A12g(20)sic,C1g(15)sic-5,IIC2g(15scl-15,IIC2g(15+)scl- |
| WC-18 | Cumulic Cryaquoll | fl | A11(20)cl,AC1(20)scl,A12bg(25)cl,IIClg(40)sl,IIA13bg(15+)scl |
| WC-19 | Histic Cryaquoll | c | O1(20)H,A11g(35)cl-15,A12g(30)cl,C1g(15+)c |

| # PLOT | SUB-GROUP | (1) FAMILY | (2) PEDON ABBREVIATION |
|---|---|---|---|
| WC-20 | Cumulic Cryaquoll | c/ssk | O1(5)F,A11g(40)sicl,A12g(30)sic,IIC1(30+)1s-40 |
| WC-21 | Histic Cryaquoll | c | O1(36)H,A11g(10)sicl,A12g(15)sicl,C1g(45+)scl |
| MC-1 | Histic Cryaquoll | fl | O1(70)F,O2(30)H,A12g(20)scl,C1g(15)sc,C2g(35)scl |
| MC-2 | Calcic Cryoboroll | fl | A11(5)1,A12(18)cl,C1(5)cl,A12b(7)cl,Cca(33)cl,Cca(32+)sl |
| MC-3 | Typic Cryoquoll | col | A11(26)1,C1(36)1s,C2(35)sl |
| MC-4 | Cumulic Cryaquoll | fl | A11(10)1,Ac1(20)scl,A12(22)cl,C1g(48+)sl |
| MC-5 | Typic Cryaquoll | fl | A11(15)1,A12(12)sl,C1(23)1s,A13bg(30)scl,A14bg(20+)scl |
| MC-6 | Typic Cryaquept | s | A11(10)1,B2(28)sl,C1(62)1s |
| WI-1 | Aquic Cryoboroll | l | A12(22)1,A12(12)sl,IIC1(25)s-70,IIC2(22)s-70,IIC3(23+)s-70 |
| WI-2 | Terric Borohemist | H | A1(25)1,O2(45)H,O2(10)H,A11bg(20)1 |
| WI-3 | Cumulic Cryaquoll | fl | A1(10)1,AC(17)1,AC2(28)1,AC3(17)cl,C1g(28)cl |
| WI-4 | Cumulic Cryaquoll | col | A1(30)1,C1(20)sl,A12b(30)1,C2(20+)1 |
| WI-5 | Cumulic Cryaquoll | fl | A11(10)1,A12(30)cl-10,A13(20)cl-40,A14(20)cl-60 |
| WI-6 | Cumulic Cryoboroll | col | A11(10)sl,A12(30)1,C1(5)s-25,A13(25)1,C2(20)scl,C3(10+)s-50 |
| WI-7 | Typic Cryorthent | ssk | A1(10)s,C1(32)s-65,C2(28)s-75,C3(?)fr |
| WI-8 | Cumulic Cryoboroll | fl | A11(20)1,A12(38)scl,O1(2)H,C1(40)scl |
| WI-9 | Cumulic Cryaquoll | col | O1(10)F,A11(15)sl,A12(15)1,A13(20)sl,A14(10)1,C1(50)sl |
| WI-10 | Typic Cryaquept | csk | O1(3)F,A11(15)sil,B2(25)cl-50,B22(30)c-60,C1(30+)c-50 |
| WI-11 | Cumulic Cryaquoll | c | A11(15)1,A12(12)cl-5,A13(33)cl-10,C1(20)c-20,IIC2(20+)scl-40 |

| # PLOT | SUB-GROUP | FAMILY | PEDON ABBREVIATION |
|---|---|---|---|
| WI-12 | Typic Cryoboroll | ssk | A1(20)l,IIC1(80)s-60 |
| WI-13 | Typic Cryaquent | ssk | C1(15)s,C2(85)s-70 |
| WI-14 | Typic Cryaquoll | s | A1(10)s,C1(10)s,A12b(22)sl,IIC2(33)s-25,IIC3(25)s-60 |
| WI-15 | Cumulic Cryoboroll | ssk | A11(18)l-10,A12(24)scl-30,C1(43)s-60 |
| T-2 | Aquic Cryofluvent | col | A11(5)sl,C1(15)ls,A12b(10)sl,C2(18)l,A13b(2)l,IIC3(12)ls-25,IIIC4(38)l |
| T-3 | Typic Cryaquent | col | O1(3)F,A1(22)sl,O2(5)H,C1(25)sl,C2(17)l,C3(33)ls |
| T-4 | Aquic Cryorthent | ssk | A1(15)sl-35,C1(25)cs-70,C2(40)fr |
| T-5 | Typic Cryaquent | s | A1(12)sl,C1(10)s,C2(38)s,IIC3(40)s-30 |
| T-6 | Aquic Cryofluvent | s | C1(20)s-5,C2(20)sl,C3(50)ls |
| DR-1 | Typic Cryaquoll | c | A11(10)sicl,A12g(20)sic,ACIg(40)c,C1g(30+)c |
| DR-2 | Cumulic Cryaquoll | fl | O1(2)F,A11(25)cl,O1(3)F,A12g(22)sicl,C1g(50+)cl |
| DR-3 | Cumulic Cryaquoll | c/lsk | A11(10)sicl,A12(30)sicl,A13(20)sic,IIC1(40)sl-50 |
| DR-4 | Cumulic Cryaquoll | c | A11(20)sicl,A12(30)sicl,A13g(25)sic,C1g(25+)c |
| WDR-5 | Argic Pachic Cryoboroll | c | A11(12)cl,Aeb(23)cl,B2t(35)cl,B3(30)cl |
| WDR-6 | Typic Cryaquoll | c | A11(8)cl,A12(12)sic,A13(20)cl,B21(40)scl,C1(20+)sic |
| WDR-7 | Typic Cryaquoll | c | A1(10)cl,B1g(27)sic,B21g(63)sic |
| H-1 | Pachic Cryoboroll | c | A11(5)cl,A12(5)cl,B1(30)c,B2(35)c,C1g(25)sc |
| H-2 | Cumulic Cryaquoll | fl | A11(7)l,A12(12)l,B1(38)l,C1(15)scl,C1g(28)cl |
| H-3 | Typic Cryaquoll | lsk | A11(13)l,IIA12(27)sicl,III(20)cl-50,IIIC1(40)scl-60 |

| # PLOT | SUB-GROUP | (1) FAMILY | (2) PEDON ABBREVIATION |
|---|---|---|---|
| H-4 | Typic Cryaquoll | lsk | A11(8)1,A12(10)1,IIA3(-12)c1-5,IIB2(15)c1-40,IIC1(35+)sc1-50 |
| H-5 | Typic Cryaquoll | col | A11(20)1,B2(10)s1,C1(40)s1,IICg(30)s |
| H-6 | Typic Cryaquoll | fl | A11(20)1,B2(25)c1,IIC1(30)s1,IIIC1(25)c1,IIIC2(?)c1-40 |
| H-7 | Typic Cryaquoll | c/l | A11(22)c1,B2g(58)c,IIC1(20)s1 |
| COT-1 | Cumulic Cryoboroll | lsk | A11(10)1,A3(13)sc1-70,B1(32)sc1-60,C1(20)sc1-70,C2(25)sc1-70 |
| COT-2 | Typic Cryaquoll | col | A11(15)c1,A12(30)sc1-10,IIC1(30)s-40,IIC2(25)s-60 |
| COT-3 | Cumulic Cryaquoll | c | A11(5)sicl,A12(15)c1,A12(25)c,C1(10)c,C2g(15)c1,C3g(20)c1 |
| COT-4 | Typic Cryaquoll | c/ssk | A11(11)c1,IIA12(29)c-10,IIB2g(35)sc-40,IIIC(27)s-60 |
| COT-5 | Histic Cryaquoll | fl | O1(27)H,A11g(19)sic,C1g(20)c1,A12bg(23)c1-20,IIC2g-30 |
| COT-6 | Argic Pachic Cryoboroll | c | A11(15)c1,A12(30)c,B2t(25)c-5,B3(20)c-10,C(10+)c-25 |
| COT-7 | Cumulic Cryaquoll | c | A11(12)c1,A12(16)c,A3(22)c,B21g(20)c,B22g(30)c |
| COT-8 | Cumulic Cryaquoll | fl | A11(15)sil,A12(17)c1-5,IIA13g(21)c1-25,IICg(47)sc1-40 |
| COT-9 | Typic Cryaquoll | c/ssk | O2(18)H,A11(22)sicl-20,B2g(15)c1-25,IIC(20+)s-70 |
| STM-1 | Typic Cryaquoll | fl | A11(9)1,A12(26)1,C1(35)sil,C2(25)sc1,C3(20+)sil |
| STM-2 | Typic Cryaquoll | fl | A11(9)1,A12(26)1,C1(35)sil,C2(25)sc1,C3(20+)sil |
| STM-3 | Typic Cryaquoll | fl | A11(12)1,A12(16)1,C1(42)1,C2(30)sc1-5 |
| STM-4 | Cumulic Cryaquoll | fl | A11(30)sil,A12(10)sil,A13(20)sil,A14(32)c1,C1(23)1 |
| STM-5 | Cumulic Cryaquoll | fl | A11(10)1,A12(45)1-5,C1(45)1-5,IIC2(15+)s1-50 |
| STM-6 | Cumulic Cryoboroll | fl | A11(10)sil,A12(30)c1-5,B21(30)1-15,B1(25)sc1-15,IIC(25+)s-30 |

| PLOT | SUB-GROUP | FAMILY | PEDON ABBREVIATION |
|---|---|---|---|
| WF-1 | Typic Cryaquoll | c/lsk | A11(10)sic,A12(15)sic-5,A13(18)c-15,B2g(20)c-25,IIC(?)1-50 |
| WF-2 | Typic Cryaquoll | lsk | A11(10)si1,A12(22)sic-5,A31(8)cl-25,B2g(20)cl-25,Cg(15)scl-50 |
| KC-1 | Cumulic Cryaquoll | col | A11(18)1-15,A12(19)sl-15,A13(28)scl,Cl(15+)s-60 |
| BC-1 | Typic Cryaquoll | lsk | A11(14)1-15,A12(26)cl-15,IICl(30+)cl-50 |
| BC-2 | Cumulic Cryaquoll | lsk | A11(20)1,A12g(15)scl,IICl(35)s-70,IIIA13b(10)cl,IVC2(20+)s-70 |
| S-1 | Pachic Cryoboroll | lsk | A11(15)1-5,A12(35)cl-5,IICl(12)scl-55,IIC2(38+)scl-60 |
| SAL-1 | Typic Cryorthent | fl | A11(5)1,Cl(42)1-20,C2(53)1-40 |
| SAL-2 | Cumulic Cryoquoll | c | A11(25)sic-10,A12(55)sic-15,Cl(30)sic |
| BT-1 | Typic Cryaquoll | c | A11(5)sicl,A12(7)sicl,A3g(28)c,B21g(7)scl-15,B22g(8)scl-10,C1g(30)scl-30,IIC(15+)1-4 |
| BT-2 | Cumulic Cryaquoll | c | A11(15)1,A12g(20)cl,A13g(25)cl,A14g(20)cl,A15g(20)cl |
| BT-3 | Terric Borohemist | H | O11(20)H,O12(30)H,A1g(35)cl,C1g(35)cl,IIC2(?)scl- |
| SFS-1 | Typic Cryaquept | fl | O1(3)H,A11(5)si1,B2g(23)sicl,Cl(40)sl-5,C12(24)1s-15 |
| SFS-2 | Typic Cryaquoll | fsi/ssk | A1(10)sl,B2(23)sicl,IIC(43)1s-60 |
| SFS-3 | Pachic Cryoboroll | fl/ssk | A11(8)1,A12(28)1-5,A3(31)1-5,IIC(33)1s-60 |
| SFS-4 | Typic Cryaquoll | fl | A11(8)1,A12(7)1,A13(23)1,Cl(23)scl-5,C2(39)scl-5 |
| SFS-5 | Typic Cryaquoll | fl | O1(8)F,A1(33)sicl,B21g(33)1,B22g(34)scl-5 |
| SFS-6 | Cumulic Cryaquoll | fl/s | O1(5)F,A1(15)1-5,A12(41)scl-5,B2g(44)1s |
| SFS-7 | Typic Cryaquoll | fsi/s | O1(8)F,A11g(15)si1,A12g(21)sicl,IIC(44)1s-5 |
| SFS-8 | Typic Cryaquoll | fl | O1(8)F,A1(20)sicl,IIB2g(38)scl-5,IICg(26+)sl-5 |
| SFS-9 | Typic Cryaquoll | fl/ssk | O2(15)H,A1(18)1,IICl(43)1s,IIC(?)s-50 |

| # PLOT | SUB-GROUP | (1) FAMILY | (2) PEDON ABBREVIATION |
|---|---|---|---|
| SFS-10 | Typic Cryaquept | fl/ssk | O1(25)mat,A1g(50)sicl,B2g(16)scl-5,IIC(?)s-35+ |
| SFS-11 | Typic Cryaquept | fs/s | O1(30)mat,A1g(30)sicl,B2g(13)scl,IIC(18+)ls |
| SFS-12 | Typic Cryaquept | c/ssk | O1(20)mat,A1g(20)sicl,B2g(30)sicl,IIC(26+)ls-40 |
| SFS-13 | Cumulic Cryaquoll | fsi/s | A11(5)sil,A12(18)sil,A13(30)sicl,IIC(47)s-25 |
| SFS-14 | Typic Cryaquoll | fl/ssk | A11(13)sicl,A12(28)scl,IIC(59)s-40 |
| SFS-15 | Typic Cryaquoll | fsi/s | O1(25)mat,A11(10)sicl,A12g(15)sicl,IIC(75)ls-15 |
| SFS-16 | Typic Cryaquoll | fl/s | A11(15)cl,IIA12(5)s,IIIA13g(28)cl,IVC1(15)s,VC2g(26)sil |
| SFS-17 | Typic Cryaquoll | fsi/ssk | A11(20)sil,IIC1(23)ls,IIIA12b(5)sil,IVC2(21)ls,IVC3(25+)s-40 |
| SFS-18 | Typic Cryaquoll | fl/s | A11(20)l,A12(26)l,IIC1(43)ls,IIC2(11+)ls |
| SFS-19 | Cumulic Cryaquoll | fsi/ssk | A11(13)sicl,A12(43)sicl,IIA13g(15)sic,IIIC1(20)ls-5,IIIC2(?)ls-40 |
| SFS-20 | Typic Cryaquent | s/c | A11(5)s-10,C1(25)s-20,C2(46)s-20,IIA12g(24)sicl,IIIC3(?)s-40 |
| SFS-21 | Aquic Cryoboroll | fl/ssk | A11(25)l,A12(11)scl,IIC1(14+)s-50 |
| SFS-22 | Typic Cryofolist | | O11(15)F,O12(28)F,O13(25)H,A11(19)scl,C1(?)sc-60 |
| SFS-23 | Typic Cryorthent | col | C1(100+)sl-20 |
| SFS-24 | Cumulic Cryaquoll | fl | A1(10)l,A12(34)l,C1(16)ls-5,IIC2(40)s-50 |
| TM-1 | Histic Cryaquoll | s | O1(20)H,A1(20)sl,C1(60)ls-10,O2(5)H,C2(15)ls-15 |
| TM-2 | Terric Borohemist | fl/s | O1(5)F,Oe2(36)H,A11g(15)sicl,A31g(10),IIC1(40)ls-5,IIIC2(20)cl,IVC3(15+)ls |
| TM-3 | Terric Borohemist | ssk | O1(22)H,Oe2(40)H,O1(28)H,C1(?)s-40 |
| TM-4 | Histic Cryaquoll | csi | O1(20)F,A11(7)sil,C1g(20)si,A12bg(20)sil,C2g(33)si |

| | | | PEDON ABBREVIATION |
|---|---|---|---|
| TM-5 | Terric Borohemist | fsi | Oi1(27)H,Oi2(22)H,C1g(10)sil,C2g(30+)sil |
| TM-6 | Terric Borohemist | fl | Oi1(25),A12g(15)1-5,Oe2(22)H,A12g(38)1-5 |
| TM-6 | Cumulic Cryaquoll | fl | A11(14)1,A12(26)1-5,AC1(30)1-5,C1(30)1-15 |
| TM-7 | Histic Cryaquept | csi | Oi(5)F,A11(5)sil,Oi(11)F,A12(14)s,B21g(12)sil,IIB22g(48)si |
| TM-8 | Typic Cryaquoll | col/ssk | A11(15)sl,A12(23)1,IIC1(3)s,Oe(2)H,IIIC(57)s-50 |
| TM-9 | Typic Cryaquent | col | Oi(27)H,C1(10)1,A1b(7)1,C1(10)sl-10,C2(20)sl,IIC3(18+)sl-50 |
| TM-10 | Typic Cryaquent | s/csi | Oi(9)H,C1(12)sil,IIC2(22)s,IIIC3(5)sil,IIIC4(14)1,IIIC5(20)si |
| TM-12 | Cumulic Cryoboroll | s | A11(10)sl-15,AC1(50)sl-5,IIC(40+)s-70 |
| TM-13 | Cumulic Cryaquoll | col | A11(9)1,A12(21)sl,A13(23)sl,C1(47)sl |
| DC-1 | Aquic Cryoboroll | fl/s | A11(20)1,C1(13)s,A1b(13)scl,C2(54)s |
| DC-2 | Typic Cryaquent | ssk | Oi(5)F,C1(41)s-20,C2(17)s-20,IIC3(37)s-50 |
| DC-3 | Typic Cryaquent | ssk | A11(5)s,C1(18)s,A12b(18)ls,IIC1(17)s-60,IIC2(42)s-70 |
| DC-4 | Typic Cryaquent | col | C(23)s,A11b(18)sl,C1(15)ls-5,C2(20)s,A12b(18)sl,IIC(6+)s-70 |
| JC-1 | Typic Cryaquoll | col | A11(13)sl,AC1(33)1,AC2(34)ls |
| JC-2 | Typic Cryaquoll | s | A11(13)sl,AC1(38)sl,C1(57)ls |
| JC-3 | Typic Cryaquoll | col/s | A11(13)sl,A12(5)sil,Ac1(20)sl,IIC(62)s |
| JC-4 | Typic Cryaquoll | ssk | A11(10)sil,A12(8)sl,AC1(30)ls,IIC(28+)ls-60 |
| JC-5 | Typic Cryoboroll | fl/ssk | A11(10)sl-5,A12(23)scl-5,IIC1(29)ls-60,IIC2(?)-60 |

| # PLOT | SUB-GROUP | (1) FAMILY | (2) PEDON ABBREVIATION |
|---|---|---|---|
| JC-6 | Typic Cryaquoll | ssk | A11(10)sl,A12(15)scl-10,IIC1(64)s-60 |
| JC-7 | Typic Cryaquent | ssk | A11(8)sl-5,C1(25)s,IIC1(27)s-60 |
| JC-8 | Typic Cryaquent | ssk | O2(8)H,C1(25)s-5,IIC2(75)s-50 |
| JC-9 | Typic Cryaquoll | fl/s | O1(5)F,A11(5)sil,A12(26)scl-15,B2g(10)scl-15,IIC(54)s-15 |
| JC-10 | Aquic Cryoboroll | fl/ssk | A11(10)1-5,A12(5)1-5,A31(33)1-5,B2g(26)cl-5,IIC1(26)s-40 |
| JC-11 | Typic Cryaquoll | fsi/s | A11(5)sil,A12(20)sil,A13(18)sicl-15,B2g(51)sicl,IIC(?)fs |
| JC-12 | Cumulic Cryoboroll | fl/ssk | A11(13)1,A12(40)1-5,AC(26)scl-25,IIC(11+)1s-40 |
| JC-13 | Typic Cryaquent | s | A11(10)1,C(20)1s-10,C1(70)s-25 |
| JC-14 | Cumulic Cryaquoll | fsi | A11(25)sil,C1(3)sl,A12(25)sil,A13(19)sil,A14(12)sil,A15(14)sil |
| JC-15 | Typic Cryaquoll | fl/ssk | A11(30)sil,C1(11)scl-5,IIC2(48)1s-10,IIC3(11+)1s-40 |
| JC-16 | Typic Cryaquoll | fl/s | A1(13)1,A12(12)scl,C1(38)1s,IIC2(24)1s-25 |
| JC-17 | Typic Cryaquent | s | A1(13)1,C1(15)s,C2(72)-20 |

# APPENDIX F

## Soil Interpretations

## EXPLANATORY FOOTNOTE FOR SOIL INTERPRETATION

(1) Depth to mottling in centimeters.

(2) Depth to ground water level.

(3) Permeability of least permeable horizon -

VS = Very Slow, S = Slow, MS = Moderately Slow, M = Moderate, MR = Moderately Rapid, R = Rapid, VR = Very Rapid.

(4) Runoff potential (Hydrologic Soil Group)

0 = Ponded, 1 = Very Slow, 2 = Slow, 3 = Medium, 4 = Rapid, 5 = Very Rapid.

(5) Inherent erodibility -

h = high, m = medium, l = low

(6) Drainage class -

0 = Very Poorly Drained, 1 = Poorly Drained, 2 = Imperfectly Drained, 3 = Moderately Well Drained, 4 = Well Drained

(7) Organic horizon thicker than 10 centimeters.

Y = Yes, N = No

(8) Depth in centimeters to the most restrictive (least permeable) layer.

## Permeability Classes

Soil permeability is that quality of soils that enables it to transmit water or air (Soil Survey Staff, 1951). Soil permeability was considered to be that of the least permeable horizon. The following permeability classes were estimated from soil texture (SCS-USDA 1972):

| Permeability Class | Numerical Range Cm/Hour |
|---|---|
| Very Slow | < .15 |
| Slow | .15 - .51 |
| Moderately Slow | .51 - 1.5 |
| Moderate | 1.5 - 5.1 |
| Moderately Rapid | 5.1 - 15.2 |
| Rapid | 15.2 - 50.8 |
| Very Rapid | > 50.8 |

## Drainage Classes

Soil drainage, as a condition, refers to the frequency and duration of periods when the soil is free or partially free of saturation. Relative soil drainage classes as described in the Soil Survey Manual (Soil Survey Staff, 1951) were estimated. Five classes of soil drainage were encountered. These were:

0 Very poorly drained - The water table remains at or near the soil surface for the greater part of the time.

1 Poorly drained - The soil remains wet for a large part of the time. The water table is commonly at or near the surface for considerable part of the years.

2 Imperfectly or somewhat poorly drained - Water is removed from the soil slowly enough to keep it wet for significant periods but not all of the time. Mottling is present in the lower A, B and C horizons.

3 Moderately well drained - Water is removed from the soil somewhat slowly, so that the profile is wet for a small but significant part of the time. There may be mottling in the C horizon.

4 Well drained - Water is removed from the soil readily but not rapidly. No mottling within the solum.

## Runoff (Hydrologic Soil Group)

Runoff or external soil drainage refers to the relative rate water is removed by flow over the surface of the soil. The Soil Survey Manual (Soil Survey Staff, 1951) recognizes six runoff classes. These are:

0 Ponded - None of the water added to the soil as precipitation or by flow escapes as runoff.

1 Very slow - Surface water flows away so very slow that free water lies on the surface for long periods or enters the soil immediately.

2 Slow - Surface water flows away so slowly that free water covers the soil for significant periods or enters the soil rapidly.

3 Medium - Surface water flows away at such a rate that water lies on the surface for short periods. A moderate proportion of the water enters the soil profile.

4 Rapid - Surface water runs off nearly as fast as it is added. Only a small part enters the soil.

5 Very rapid - Surface water runs off as fast as it is added.

## Inherent Erodibility

Erodibility classes were determined by approximating the "K" value primarily from the texture of the surface horizon. Guidelines followed were those outlined by Erickson (1973). The following classes were recognized:

| | |
|---|---|
| Low erodibility | $K < .20$ |
| Moderate erodibility | $.20 < K < .40$ |
| High erodibility | $K > .40$ |

| SITE | MOTTLING | GWL | PERM | POTENTIAL | ERODIBILITY | CLASS | 10 CM | LAYER |
|---|---|---|---|---|---|---|---|---|
| JC-1 | 0 | 38 | MR | 2 | h | 1 | N | 13 |
| JC-2 | 0 | 30 | MR | 1 | 1 | 1 | N | 13 |
| JC-3 | 0 | 0 | M | 1 | 1 | 1 | N | 13 |
| JC-4 | 10 | 18 | M | 2 | h | 1 | N | 0 |
| JC-5 | -- | 33 | M | 3 | m | 4 | N | 10 |
| JC-6 | 10 | ? | M | 1 | 1 | 1 | N | 10 |
| JC-7 | -- | 35 | MR | 1 | 1 | 2 | N | 0 |
| JC-8 | 25 | 13 | M | 2 | h | 1 | N | 0 |
| JC-9 | 10 | 0 | S | 2 | h | 2 | N | 54 |
| JC-10 | 10 | ? | MS | 2 | h | 2 | N | 48 |
| JC-11 | 35 | 43 | S | 1 | h | 1 | N | 25 |
| JC-12 | -- | 0 | M | 4 | h | 4 | N | 53 |
| JC-13 | -- | 0 | MR | 0 | 1 | 1 | N | 0 |
| JC-14 | 86 | 0 | MS | 2 | h | 1 | N | 28 |
| JC-15 | 41 | 3 | M | 3 | h | 2 | N | 30 |
| JC-16 | 13 | 0 | M | 2 | h | 2 | N | 0 |
| JC-17 | 13 | 28 | M | 1 | h | 2 | N | 0 |
| SFS-1 | 13 | 25 | S | 2 | h | 1 | N | 13 |

| SITE | (1) DEPTH TO MOTTLING | (2) GWL | (3) PERM | (4) RUNOFF POTENTIAL | (5) INHERENT ERODIBILITY | (6) DRAINAGE CLASS | (7) ORGANIC 10 CM | (8) DEPTH TO RESTRICTIVE LAYER |
|---|---|---|---|---|---|---|---|---|
| SFS-2 | 10 | 0 | S | 1 | m | 1 | N | 10 |
| SFS-3 | 8 | 76 | MS | 2 | h | 3 | N | 36 |
| SFS-4 | 38 | ? | MS | 3 | h | 2 | N | 38 |
| SFS-5 | 0 | 0 | S | 0 | 1 | 0 | N | 0 |
| SFS-6 | 0 | 0 | MS | 0 | 1 | 0 | N | 0 |
| SFS-7 | 15 | 0 | MS | 0 | 1 | 0 | N | 15 |
| SFS-8 | 20 | 0 | MS | 0 | 1 | 0 | N | 0 |
| SFS-9 | 15 | 20 | M | 2 | h | 2 | N | 15 |
| SFS-10 | 50 | 8 | S | 2 | 1 | 1 | Y | 0 |
| SFS-11 | 30 | 10 | S | 1 | 1 | 1 | Y | 0 |
| SFS-12 | 0 | 0 | S | 1 | 1 | 1 | Y | 20 |
| SFS-13 | 5 | 15 | S | 2 | h | 2 | N | 23 |
| SFS-14 | 13 | 46 | MS | 2 | h | 2 | N | 0 |
| SFS-15 | 10 | 0 | S | 1 | 1 | 1 | Y | 10 |
| SFS-16 | 0 | 25 | MS | 2 | m | 1 | N | 0 |
| SFS-17 | 20 | 20 | S | 2 | h | 1 | N | 0 |
| SFS-18 | 20 | 50 | MR | 3 | h | 2 | N | 20 |
| SFS-19 | 56 | 46 | S | 3 | h | 2 | N | 56 |

## Runoff (Hydrologic Soil Group)

Runoff or external soil drainage refers to the relative rate water is removed by flow over the surface of the soil. The Soil Survey Manual (Soil Survey Staff, 1951) recognizes six runoff classes. These are:

0 Ponded - None of the water added to the soil as precipitation or by flow escapes as runoff.

1 Very slow - Surface water flows away so very slow that free water lies on the surface for long periods or enters the soil immediately.

2 Slow - Surface water flows away so slowly that free water covers the soil for significant periods or enters the soil rapidly.

3 Medium - Surface water flows away at such a rate that water lies on the surface for short periods. A moderate proportion of the water enters the soil profile.

4 Rapid - Surface water runs off nearly as fast as it is added. Only a small part enters the soil.

5 Very rapid - Surface water runs off as fast as it is added.

## Inherent Erodibility

Erodibility classes were determined by approximating the "K" value primarily from the texture of the surface horizon. Guidelines followed were those outlined by Erickson (1973). The following classes were recognized:

| | |
|---|---|
| Low erodibility | $K < .20$ |
| Moderate erodibility | $.20 < K < .40$ |
| High erodibility | $K > .40$ |

| SITE | (1) DEPTH TO MOTTLING | (2) GWL | (3) PERM | (4) RUNOFF POTENTIAL | (5) INHERENT ERODIBILITY | (6) DRAINAGE CLASS | (7) ORGANIC 10 CM | (8) DEPTH TO RESTRICTIVE LAYER |
|---|---|---|---|---|---|---|---|---|
| SFS-2 | 10 | 0 | S | 1 | m | 1 | N | 10 |
| SFS-3 | 8 | 76 | MS | 2 | h | 3 | N | 36 |
| SFS-4 | 38 | ? | MS | 3 | h | 2 | N | 38 |
| SFS-5 | 0 | 0 | S | 0 | 1 | 0 | N | 0 |
| SFS-6 | 0 | 0 | MS | 0 | 1 | 0 | N | 0 |
| SFS-7 | 15 | 0 | MS | 0 | 1 | 0 | N | 15 |
| SFS-8 | 20 | 0 | MS | 0 | 1 | 0 | N | 0 |
| SFS-9 | 15 | 20 | M | 2 | h | 2 | N | 15 |
| SFS-10 | 50 | 8 | S | 2 | 1 | 1 | Y | 0 |
| SFS-11 | 30 | 10 | S | 1 | 1 | 1 | Y | 0 |
| SFS-12 | 0 | 0 | S | 1 | 1 | 1 | Y | 20 |
| SFS-13 | 5 | 15 | S | 2 | h | 2 | N | 23 |
| SFS-14 | 13 | 46 | MS | 2 | h | 2 | N | 0 |
| SFS-15 | 10 | 0 | S | 1 | 1 | 1 | Y | 10 |
| SFS-16 | 0 | 25 | MS | 2 | m | 1 | N | 0 |
| SFS-17 | 20 | 20 | S | 2 | h | 1 | N | 0 |
| SFS-18 | 20 | 50 | MR | 3 | h | 2 | N | 20 |
| SFS-19 | 56 | 46 | S | 3 | h | 2 | N | 56 |

| SITE | (1) MOTTLING | (2) GWL | (3) PERM | RUNOFF POTENTIAL | INHERENT ERODIBILITY | DRAINAGE CLASS | ORGANIC 10 CM | RESTRICTIVE LAYER |
|---|---|---|---|---|---|---|---|---|
| SFS-20 | 5 | 30 | S | 3 | l | 3 | N | 76 |
| SFS-21 | -- | 25 | MS | 4 | m | l | N | 0 |
| SFS-22 | -- | 100 | R | 4 | l | 4 | Y | -- |
| SFS-23 | -- | 100+ | MR | 4 | h | 4 | N | 0 |
| SFS-24 | 0 | 50 | MR | 2 | h | 2 | N | 10 |
| TM-1 | 0 | 20 | MR | 3 | l | l | Y | 0 |
| TM-2 | -- | 0 | S | 3 | h | l | Y | 0 |
| TM-3 | 68 | 22 | R | 3 | l | l | Y | 0 |
| TM-4 | 47 | ? | MS | l | h | l | Y | 0 |
| TM-5 | -- | 100+ | M | 2 | h | 2 | Y | 0 |
| TM-6 | 0 | 75 | MR | 2 | h | 2 | N | 14 |
| TM-6 | -- | 0 | MR | 4 | h | 2 | Y | 0 |
| TM-7 | 26 | 26 | MS | l | h | l | Y | 14 |
| TM-8 | 10 | 55 | MR | 2 | m | l | N | 15 |
| TM-9 | 27 | 53 | MR | 3 | h | 2 | Y | 0 |
| TM-10 | 0 | 40 | S | l | s | l | Y | 60 |
| TM-12 | -- | 60 | R | 4 | l | 4 | N | 10 |
| TM-13 | 9 | 50 | MR | 2 | h | l | N | 53 |

| SITE | (1) DEPTH TO MOTTLING | (2) GWL | (3) PERM | (4) RUNOFF POTENTIAL | (5) INHERENT ERODIBILITY | (6) DRAINAGE CLASS | (7) ORGANIC 10 CM | (8) DEPTH TO RESTRICTIVE LAYER |
|---|---|---|---|---|---|---|---|---|
| WC-11 | -- | 15 | S | 1 | 1 | 1 | Y | 22 |
| WC-12 | ? | 0 | VS | 1 | 1 | 0 | Y | 0 |
| WC-13 | 40 | 12 | VS | 1 | 1 | 1 | Y | |
| WC-14 | 30 | 58 | M | 2 | 1 | 1 | N | 33 |
| WC-15 | -- | 30 | M | 1 | m | 1 | N | 0 |
| WC-16 | -- | 0 | R | 1 | 1 | 0 | Y | |
| WC-17 | 55 | 35 | VS | 1 | 1 | 1 | Y | |
| WC-18 | 20 | 105 | MS | 3 | m | 2 | N | 40 |
| WC-19 | -- | 0 | S | 1 | 1 | 1 | Y | |
| WC-20 | -- | 20 | S | 1 | 1 | 1 | N | 40 |
| WC-21 | -- | 2 | S | 1 | 1 | 0 | Y | 0 |
| MC-1 | 70 | 20 | S | 1 | 1 | 1 | Y | |
| MC-2 | -- | 100+ | MS | 3 | h | 3 | N | |
| MC-3 | -- | 0 | R | 1 | h | 0 | N | |
| MC-4 | 10 | 100 | MS | 2 | h | 2 | N | |
| MC-5 | -- | 25 | M | 1 | h | 1 | N | 100 |
| MC-6 | 10 | 40 | MR | 1 | h | 1 | N | 0 |
| WI-1 | -- | 77 | MR | 1 | h | 3 | N | |
| WI-2 | -- | 0 | MR | 1 | h | 1 | Y | 80 |

| SITE | (1) TO MOTTLING | (2) GWL | (3) PERM | (4) RUNOFF POTENTIAL | (5) INHERENT ERODIBILITY | (6) DRAINAGE CLASS | (7) ORGANIC 10 CM | DEPTH TO RESTRICTIVE LAYER |
|---|---|---|---|---|---|---|---|---|
| WI-5 | 10 | 65 | MS | 2 | m | 1 | N | |
| WI-6 | 70 | 90 | MR | 3 | 1 | 3 | N | 45 |
| WI-7 | -- | 80 | R | 3 | 1 | 3 | N | 0 |
| WI-8 | 60 | 100+ | MR | 3 | 1 | 3 | N | 20 |
| WI-9 | 15 | 100+ | R | 3 | 1 | 2 | N | 15 |
| WI-10 | 15 | 15 | S | 0 | h | 1 | N | |
| WI-11 | 27 | 100+ | S | 2 | m | 2 | N | 27 |
| WI-12 | -- | 100+ | R | 3 | h | 4 | N | 0 |
| WI-13 | -- | 50 | VR | 3 | 1 | 1 | N | |
| WI-14 | 10 | 100+ | R | 3 | 1 | 2 | N | 0 |
| T-1 | -- | 21 | M | 3 | h | 1 | N | |
| T-2 | 20 | 50 | MR | 3 | 1 | 1 | N | 62 |
| T-3 | 3 | 25 | MR | 3 | 1 | 1 | N | 50 |
| T-4 | -- | 40 | VR | 3 | 1 | 1 | N | 0 |
| T-5 | 0 | 55 | R | 2 | 1 | 1 | N | 0 |
| T-6 | 0 | 70 | R | 3 | 1 | 1 | N | 20 |
| DR-1 | 10 | 33 | VS | 1 | m | 0 | N | |
| DR-2 | 0 | 25 | S | 2 | m | 1 | N | 28 |

| SITE | (1) DEPTH TO MOTTLING | (2) GWL | (3) PERM | (4) RUNOFF POTENTIAL | (5) INHERENT ERODIBILITY | (6) DRAINAGE CLASS | (7) ORGANIC 10 CM | (8) DEPTH TO RESTRICTIVE LAYER |
|---|---|---|---|---|---|---|---|---|
| DR-3 | 0 | 40 | S | 1 | h | 1 | N | 40 |
| DR-4 | 0 | 45 | S | 1 | h | 1 | N | |
| WDR-5 | -- | 100+ | MS | 3 | m | 4 | N | 12 |
| WDR-6 | 20 | 80 | S | 1 | m | 2 | N | 8 |
| WDR-7 | 10 | ? | S | 1 | m | 1 | N | 10 |
| H-1 | 40 | 90 | S | 2 | m | 2 | N | 10 |
| H-2 | 19 | 57 | MS | 3 | h | 1 | N | 72 |
| H-3 | 40 | 50 | S | 3 | h | 1 | N | |
| H-4 | 0 | 45 | S | 3 | m | 1 | N | |
| H-5 | 0 | 34 | MR | 2 | h | 1 | N | 0 |
| H-6 | 0 | 40 | MS | 2 | h | 1 | N | 75 |
| H-7 | 22 | 10 | S | 1 | m | 1 | N | |
| COT-1 | 10 | 100+ | M | 3 | m | 2 | N | 23 |
| COT-2 | 15 | 75 | MS | 2 | m | 1 | N | 0 |

# Appendix G. Association Tables

Vegetaion Cover Codes;

| | |
|---|---|
| T | 0 - 1% |
| 1 | 2 - 5% |
| 2 | 6 - 10% |
| 3 | 11 - 15% |
| 4 | 16 - 25% |
| 5 | 26 - 50% |
| 6 | 51 - 75% |
| 7 | 76 - 95% |
| 8 | 96 - 100% |

| | ALNU - COST | | | | | | | | | ALSI | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | DC 1 | DC 2 | SFS 22 | DC 4 | DC 3 | DW 1 | TM 12 | DW 3 | SFS 20 | SFS 23 | WL 1 |
| | 98 | 97 | 106 | 107 | 100 | 104 | 101 | 103 | 99 | 105 | 102 |
| ABIE LASI | . | . | T | 3 | 3 | T | 1 | . | . | . | 4 |
| PICE ENGL | . | . | 1 | 1 | . | . | . | . | 1 | 1 | . |
| PINU CONT | . | . | . | . | . | . | 1 | . | . | 3 | . |
| ALNU INCA | 6 | 6 | 3 | 1 | 5 | . | . | . | 6 | . | . |
| ALNU SINU | . | . | 5 | 6 | 5 | 6 | 6 | 7 | . | 6 | 6 |
| BETU GLAN | . | . | . | . | . | . | . | . | 4 | . | . |
| CORN STOL | 5 | 7 | 5 | 2 | 5 | 3 | . | 1 | . | . | . |
| LONI INVO | 1 | . | . | . | 1 | 2 | T | . | . | . | T |
| RIBE INER | . | . | 1 | . | . | . | . | . | . | . | . |
| RIBE LACU | 2 | 1 | 2 | 1 | 2 | 1 | 1 | 5 | . | 1 | 1 |
| RUBU PARV | 2 | . | 1 | 1 | 3 | T | . | . | . | . | T |
| SALX BARC | . | . | . | . | . | . | 1 | 1 | . | . | . |
| SALX RIGI | . | . | . | . | . | . | . | . | . | 1 | . |
| SALX SCOU | . | . | . | . | . | . | 1 | . | . | . | . |
| ALOP ALPI | . | . | . | . | . | . | T | . | . | . | . |
| BROM CILI | . | . | . | . | . | . | T | . | . | . | . |
| CALA CANA | . | . | T | . | . | . | . | . | 1 | . | . |
| CARX AQUA | . | . | . | . | . | . | . | . | 7 | . | . |
| CARX ATHR | . | . | . | T | . | . | . | . | . | . | . |
| CARX NEUR | . | . | . | . | T | . | . | . | . | . | . |
| CARX SCOP | . | . | . | T | . | . | . | . | . | . | . |
| DESC ELON | . | . | . | . | . | . | . | . | . | T | . |
| GLYC STRI | 5 | 2 | . | 1 | 2 | T | . | . | . | . | . |
| LUZU PARV | . | . | . | T | . | . | . | . | . | T | . |
| POA PALU | . | . | . | . | . | . | . | . | . | . | T |
| ACHI MILL | . | . | . | . | . | . | 1 | . | T | T | . |
| ACON COLU | . | . | T | 1 | . | . | 1 | . | 1 | . | . |
| ACTA RUBR | . | . | T | 1 | . | 1 | 2 | T | . | . | . |
| ANGE ARGU | . | . | . | . | . | 1 | 1 | . | 1 | . | . |
| ANTE ROSE | . | . | . | . | . | . | T | . | . | T | . |
| ASTE FOLI | . | . | . | . | . | . | 1 | . | . | . | . |
| ATHY FELI | 2 | T | . | T | 2 | . | . | 1 | . | . | . |
| CAST MINI | . | . | . | . | . | . | T | . | T | . | . |
| CORY CASE | . | . | . | 3 | 2 | . | . | 2 | . | . | . |
| DODE JEFF | . | . | . | T | . | . | . | . | . | . | . |
| EPIL ANGU | . | . | . | T | . | . | 1 | . | T | T | . |
| EPIL GLAN | . | . | . | . | . | T | T | . | T | . | . |
| EQUI ARVE | . | 1 | . | . | . | . | . | . | 1 | . | . |
| FRAG VIRG | . | T | 1 | . | 1 | . | T | . | . | T | . |
| GALI TRFL | 2 | T | T | T | 1 | 3 | | 1 | T | T | . |
| GEUM MACR | 2 | . | . | T | 1 | . | . | . | . | . | . |
| HABE HYPE | . | T | . | 1 | T | . | . | . | T | . | . |
| HERA LANA | 1 | . | . | . | 1 | . | . | . | . | . | . |
| LIGU CANB | . | 1 | . | . | 1 | . | 3 | . | T | . | . |
| LUPI POLY | . | . | . | . | . | . | T | . | . | . | . |
| MITE PENT | T | . | . | T | . | T | T | T | . | T | T |
| MONT CORD | 1 | T | 1 | 2 | 1 | 3 | . | . | . | . | . |
| OSMO CHIL | T | 1 | T | T | . | T | . | . | . | . | . |
| PARN FIBR | . | . | . | . | . | . | T | . | . | . | . |
| POLE OCCE | . | . | . | . | . | . | . | . | T | . | . |
| PYRO ASAR | 1 | . | . | . | . | . | . | . | . | . | . |
| RANU ALIS | . | . | . | . | . | . | 4 | . | . | . | . |
| SANG SITC | T | . | . | T | 2 | . | . | . | T | . | T |
| SAXA ARGU | T | . | T | 3 | 1 | T | T | T | . | . | . |
| SENE PSEU | . | . | . | . | . | . | . | . | 1 | . | . |
| SENE TRIA | 2 | . | . | 2 | 2 | 1 | 3 | . | . | . | T |
| SMIL STEL | T | 1 | . | . | 1 | . | . | . | . | . | . |
| SPIR DENS | 2 | . | T | T | . | . | . | . | T | . | . |
| STEL LONG | . | . | . | . | . | . | . | . | T | . | . |
| STRE AMPL | . | . | 2 | 1 | . | 1 | . | . | . | . | T |
| TARX OFFI | . | T | . | . | . | . | . | . | . | . | . |
| THAL FEND | . | . | 1 | . | . | . | . | . | . | . | . |
| THAL OCCI | . | . | . | . | . | 3 | T | T | . | . | T |
| URTI DIOI | 1 | . | . | . | T | . | . | 2 | . | . | . |

| | ASIN-FEID | | | POPR | | JUBA | | | POFR/DAIN | POFR/POPR | ARCA |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | STM 6 | SAL 1 | SFS 3 | WF 1 | WF A-2 | SFS 14 | SFS 2 | WC 17 | JC 5 | MC 2 | WC A-18 |
| | 85 | 83 | 138 | 84 | 92 | 154 | 153 | 88 | 108 | 96 | 95 |
| POTE FRUT | . | . | . | . | . | . | | . | 5 | 4 | . |
| ROSA SP | . | . | . | . | . | . | | . | . | T | . |
| AGRO CANI | T | T | . | . | . | . | | . | T | . | T |
| AGRS SCAB | 2 | . | . | . | . | . | | . | . | . | . |
| ALOP ALPI | . | . | . | . | . | . | | T | . | . | . |
| BROM CARI | . | T | . | . | . | . | . | . | . | . | . |
| BROM CILI | . | . | . | . | . | . | . | . | . | . | T |
| CALA INEX | . | . | . | . | . | . | . | T | . | . | . |
| CARX AQUA | . | . | . | . | . | 3 | | 4 | . | . | . |
| CARX ATHR | . | . | . | . | . | . | 1 | . | . | . | . |
| CARX LANU | . | . | . | . | . | T | . | . | . | . | . |
| CARX LEPO | . | . | . | . | . | 3 | . | . | T | . | . |
| CARX MICR | . | . | . | 5 | T | . | . | . | . | . | . |
| CARX NEUR | . | 1 | . | . | . | . | . | . | . | . | . |
| CARX RAYN | . | 2 | . | . | . | . | . | . | . | . | . |
| DANT CALI | . | . | . | . | . | . | . | . | . | . | T |
| DANT INTE | 1 | . | . | . | . | . | . | . | 3 | . | . |
| DESC CESP | T | . | . | 1 | . | . | . | 1 | . | . | . |
| FEST IDAH | 4 | . | 5 | . | . | . | . | . | T | . | . |
| HORD BRAC | . | . | . | . | . | . | . | T | . | . | T |
| JUNC BALT | . | . | . | T | T | 5 | 7 | 6 | . | . | . |
| JUNC LONG | 5 | . | . | . | . | . | . | . | . | . | . |
| MELI SPEC | . | 1 | . | . | . | . | . | . | . | . | . |
| PHLE ALPI | . | T | . | . | . | . | . | T | . | . | . |
| PHLE PRAT | 1 | . | . | 5 | T | . | . | . | . | . | 5 |
| POA PALU | . | . | . | . | . | . | . | . | . | . | 1 |
| POA PRAT | T | . | . | 3 | 5 | T | . | T | . | . | T |
| ACHI MILL | T | T | 3 | T | T | 1 | . | T | 1 | T | T |
| AGOS GLAU | . | T | 5 | . | . | 2 | . | . | . | . | . |
| ANTE ROSE | . | . | . | . | . | 2 | . | . | T | T | . |
| ARNI CHAM | . | . | . | . | . | . | . | . | . | . | T |
| ASTE FOLI | . | . | . | . | . | . | . | 1 | . | . | T |
| ASTE INTE | . | 5 | 6 | . | . | . | . | . | . | . | . |
| ASTE OCCI | 2 | . | . | 1 | T | . | . | . | . | . | . |
| CAMA GUAM | . | . | T | . | . | T | 5 | . | . | . | . |
| CAST COVI | . | . | T | . | . | T | . | . | T | . | . |
| EPIL GLAN | T | . | . | T | . | . | T | T | . | . | . |
| FRAG VIRG | . | . | . | T | 2 | . | . | . | . | 1 | T |
| GALI BORE | . | . | . | . | . | . | . | . | . | . | T |
| GENT AFFI | . | . | T | . | . | T | . | . | . | T | . |
| GERA VISC | . | 5 | . | . | . | . | . | . | . | . | 4 |
| GEUM MACR | . | . | . | T | . | . | . | T | . | . | . |
| LUPI POLY | . | T | . | . | . | . | . | . | . | . | . |
| PEDI GROE | . | . | . | . | . | T | . | T | . | . | . |
| PENS GLOB | . | . | . | . | . | T | . | . | . | . | . |
| PERI GAIR | T | . | . | 3 | 3 | . | . | . | . | . | T |
| POLY BIST | . | . | T | . | . | T | . | . | . | . | . |
| POTE GRAC | 3 | 5 | 3 | 2 | T | 1 | . | . | 1 | 1 | 5 |
| RANU ALIS | . | . | . | . | . | T | . | T | . | . | . |
| RANU UNCI | . | . | . | 1 | . | . | . | . | . | . | . |
| SENE INTE | . | . | . | . | . | . | . | . | 4 | . | . |
| SENE PSEU | . | . | . | . | . | T | . | . | . | . | . |
| SENE SPHA | . | . | . | . | . | . | | 2 | . | . | . |
| SPIR DENS | . | . | 2 | . | . | . | | . | . | . | . |
| SPIR ROMA | 1 | . | . | . | . | . | . | . | . | . | . |
| STEL LONG | . | . | . | . | . | . | . | T | . | . | . |
| TARX OFFI | . | . | . | . | . | . | . | . | T | . | 3 |
| TRIF ERIO | . | . | . | T | 2 | . | . | 1 | . | . | T |
| TRIF LONG | . | . | 6 | . | . | 4 | . | . | . | . | . |
| TRIF REPE | 4 | . | . | . | . | . | . | . | . | . | . |
| VALE OCCI | . | . | . | . | . | . | . | . | . | . | T |
| WHET HELI | T | . | . | 5 | 5 | . | . | . | . | . | . |

| | | MESIC GRAMINOID MEADOW | | | | | | | | DECE | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | TM 12 | JC 1 | STM 3 | DR 1 | BC 1 | WC 2 | S 1 | H 3 | STM 4 | TM 6 | SFS 7 | SFS 4 | JC 10 | SFS 1 |
| | | 150 | 144 | 87 | 91 | 93 | 89 | 91 | 91 | 86 | 140 | 141 | 142 | 139 | 143 |
| LONI | CAER | . | . | . | . | . | . | . | . | . | . | 1 | . | . | . |
| SALX | GEYE | . | . | . | . | T | . | . | . | . | . | . | . | . | . |
| SALX | WOLF | T | . | . | . | . | . | . | . | . | . | . | . | . | . |
| AGRO | CANI | . | . | . | . | T | . | T | . | . | . | . | . | . | . |
| AGRO | THUR | . | . | . | . | . | 2 | . | . | . | . | . | . | . | . |
| ALOP | ALPI | . | . | . | 5 | . | 2 | . | . | . | . | . | . | . | . |
| CALA | CANA | . | 5 | . | . | . | T | . | . | . | 2 | . | . | . | 4 |
| CARX | AQUA | . | 3 | . | . | . | 5 | . | 1 | . | . | 1 | . | T | . |
| CARX | ATHR | . | T | 6 | 6 | . | . | . | . | 3 | . | . | . | . | . |
| CARX | DOUG | . | . | . | . | . | . | . | 1 | . | . | . | . | . | . |
| CARX | JONE | T | . | . | . | . | . | . | . | . | . | . | . | . | . |
| CARX | LANU | . | . | . | . | . | . | . | . | . | . | . | T | . | 1 |
| CARX | LEPO | . | 3 | . | . | . | . | . | . | . | . | . | . | 2 | 5 |
| CARX | LUZU | 5 | . | . | . | . | . | . | . | . | 4 | . | . | . | . |
| CARX | MICR | . | . | . | . | . | . | . | T | . | . | 7 | . | . | . |
| CARX | NEBR | . | . | . | . | . | 1 | . | . | . | . | . | . | . | . |
| CARX | RAYN | . | . | . | T | . | . | . | . | . | . | . | . | . | . |
| CARX | ROST | . | . | . | . | . | . | . | . | T | T | . | . | . | . |
| CARX | SIMI | . | . | . | . | . | 1 | . | . | . | . | . | . | . | . |
| DANT | CALI | . | . | . | . | . | . | . | 3 | . | . | . | . | . | . |
| DANT | INTE | . | . | . | . | . | . | . | . | . | . | . | 2 | . | . |
| DESC | CESP | 1 | . | T | . | . | . | . | 2 | 5 | 5 | 3 | 6 | 3 | 5 |
| ELEO | PALU | . | . | 1 | . | . | . | . | . | T | . | . | . | . | . |
| ELEO | PAUC | 1 | . | . | . | . | . | . | . | . | . | . | . | . | . |
| ELYM | GLAU | . | . | . | . | . | . | T | . | . | . | . | . | . | . |
| GLYC | STRI | . | . | . | . | . | 1 | . | . | . | . | . | . | . | . |
| HORD | BRAC | . | . | T | . | . | 1 | 3 | T | 3 | . | . | . | . | . |
| JUNC | BALT | . | . | . | . | . | . | . | 3 | . | . | 1 | T | T | . |
| JUNC | ENSI | . | . | . | . | . | . | . | . | . | . | . | 1 | . | . |
| JUNC | LONG | . | . | . | . | . | T | . | . | . | . | . | . | . | . |
| LUZU | CAMP | 1 | . | . | . | . | . | . | . | . | . | . | . | . | . |
| MUHL | FILI | . | . | . | . | . | . | . | . | . | T | . | . | . | . |
| PHLE | ALPI | T | . | . | T | . | . | . | . | . | . | T | T | . | T |
| PHLE | PRAT | . | T | . | . | T | 1 | 2 | 2 | . | . | . | . | . | . |
| POA | PALU | . | . | . | . | 7 | T | . | 1 | . | . | . | . | . | . |
| POA | PRAT | . | . | . | T | T | T | T | T | . | . | . | . | . | . |
| TRIS | WOLF | . | T | . | T | . | . | . | T | . | . | . | . | . | T |
| ACHI | MILL | . | 1 | . | . | T | T | T | 1 | . | . | . | 4 | T | . |
| AGOS | GLAU | . | . | . | . | . | . | . | T | . | . | . | 5 | T | . |
| ANTE | CORY | . | . | . | . | . | . | . | . | . | . | . | . | 1 | . |
| ANTE | ROSE | 6 | . | . | . | . | . | . | . | . | T | T | T | . | 4 |
| ARNI | CHAM | . | . | 6 | 1 | . | 2 | . | 1 | 5 | . | . | . | . | T |
| ASTE | EATO | . | . | T | . | . | . | . | . | T | . | . | . | . | . |
| ASTE | FOLI | 1 | . | . | . | . | . | . | T | . | 2 | . | 6 | T | . |
| ASTE | INTE | . | . | . | T | T | . | T | . | . | . | . | . | . | 1 |
| ASTE | OCCI | . | . | . | . | . | . | T | . | . | . | . | . | . | . |
| CALT | BICO | 4 | . | . | . | . | . | . | . | . | 3 | . | . | . | . |
| CAMA | QUAM | . | . | . | 1 | . | . | . | T | . | . | 1 | T | . | 2 |
| CAST | COVI | . | T | . | . | . | . | . | . | . | . | . | 1 | T | T |
| CAST | MINI | . | . | . | . | . | . | . | T | . | . | . | . | . | . |
| DODE | JEFF | 1 | T | . | . | . | . | . | . | . | 4 | 5 | . | . | . |
| EPIL | GLAN | . | . | . | 1 | . | 1 | T | T | T | T | T | . | . | 2 |
| EQUI | ARVE | . | T | . | . | . | . | . | . | . | . | . | . | . | . |
| FRAG | VIRG | . | . | . | . | T | . | . | . | . | . | . | . | . | . |
| GALI | BORE | . | . | . | . | T | . | . | . | . | . | . | . | . | . |
| GENT | AFFI | . | . | . | . | . | . | . | . | . | T | . | T | T | T |
| GEUM | MACR | . | . | . | . | 1 | . | . | . | . | T | . | . | . | . |
| HABE | HYPE | . | . | . | T | . | . | . | . | . | . | . | . | . | . |
| LIGU | TENU | 2 | . | . | . | . | . | . | . | . | 1 | . | . | . | . |
| LUPI | POLY | . | T | . | . | . | . | . | . | . | . | . | . | . | . |
| MENT | ARVE | . | . | . | . | . | . | . | 2 | . | . | . | . | . | . |
| MIMU | PRIM | T | . | . | . | . | . | . | . | . | . | T | . | . | . |
| PEDI | GROE | T | . | . | T | . | T | . | . | . | T | 3 | . | . | 5 |
| PENS | GLOB | . | . | . | . | . | . | . | . | . | . | T | 1 | 2 | 4 |
| PERI | GAIR | . | . | . | T | T | . | 2 | T | . | . | . | . | . | . |
| POLY | BIST | . | 3 | . | . | . | . | . | T | . | 1 | 1 | 3 | 2 | 2 |
| POTE | GRAC | T | 1 | . | . | T | T | 1 | 2 | . | . | 1 | 5 | T | 4 |
| RANU | ALIS | T | 4 | . | . | . | . | . | . | . | T | 1 | . | 2 | 3 |
| RANU | UNCI | . | . | . | 1 | . | T | . | 1 | . | . | . | . | . | . |
| RYDB | OCCI | . | . | . | . | T | . | . | . | . | . | . | . | . | . |
| SANG | SITC | . | 1 | . | . | . | . | . | . | . | . | . | . | . | . |
| SAXA | OREG | . | 3 | . | . | . | . | . | T | . | T | 2 | . | . | . |
| SENE | HYDR | . | . | . | 3 | . | . | . | . | . | . | . | . | . | . |
| SENE | INTE | . | . | . | . | . | 3 | 4 | 3 | . | 1 | . | 1 | 2 | . |
| SENE | SUBN | T | . | . | . | . | . | . | . | . | . | . | . | . | . |
| SOLI | CANA | . | . | . | . | 3 | . | . | . | . | . | . | . | . | . |
| SPIR | ROMA | T | . | . | . | . | . | . | . | . | . | . | . | . | . |
| STEL | LONG | . | . | . | . | . | . | . | T | . | . | T | T | . | . |
| SWER | PERE | T | . | . | . | . | . | . | . | . | . | . | . | . | . |
| TARX | OFFI | . | . | . | . | T | . | . | . | . | . | . | . | . | T |
| TRIF | ERIO | . | . | . | 1 | . | T | T | 3 | T | . | . | . | . | . |
| TRIF | LONG | . | 1 | . | . | . | . | . | . | . | . | T | 5 | 2 | 1 |
| WHET | HELI | . | . | . | 4 | . | T | 1 | 1 | . | . | . | . | . | . |

| | | CARO | | | | | | | | | CAAQ | | | | | | CACA | | | | | CAS1 | ELPA | | ELPAL | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | H | DR | WC | WI | WI | STM | WC | TM | SFS | SFS | WC | SFS | SFS | DW | SAL | BT | DW | SFS | TM | SFS | SFS | JC | JC | STM | WC |
| | | 7 | 4 | 8 | A-5 | 10 | 2 | 11 | 4 | 12 | 18 | 4 | 16 | 5 | 5 | 2 | 1 | 4 | 25 | 10 | 26 | 8 | 9 | 14 | 1 | A-13 |
| | | 69 | 68 | 67 | 66 | 65 | 64 | 161 | 166 | 162 | 163 | 71 | 155 | 164 | 165 | 70 | 82 | 149 | 147 | 146 | 148 | 159 | 156 | 157 | 72 | 73 |
| PICE | ENGL | . | . | . | . | T | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| LONI | CAER | . | . | . | . | . | . | . | . | . | . | . | . | 1 | . | . | . | . | . | . | . | T | . | . | . | . |
| SALX | DRUM | 1 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| SALX | MYRT | T | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| SALX | RIGI | . | . | . | 1 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| AGRO | CANI | . | . | . | . | . | . | . | . | . | T | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| ALOP | ALPI | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 5 | . | . | . | . | . | . | . | . | . |
| CALA | CANA | 1 | . | . | . | . | . | . | . | . | T | . | . | . | . | 1 | 6 | 8 | 7 | 6 | 7 | . | . | . | . | . |
| CARX | AQUA | T | . | 1 | . | . | . | 1 | 4 | 5 | 8 | 7 | 8 | 8 | 7 | 8 | 2 | . | . | T | . | 1 | T | 3 | . | . |
| CARX | ATHR | . | . | . | . | . | T | . | . | . | . | . | . | . | . | T | 2 | . | . | . | . | . | . | . | 1 | . |
| CARX | JONE | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 4 | . | 3 | . | . | . | . |
| CARX | LANU | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 3 | . | . |
| CARX | MICR | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | T | . | . | . | . | 1 | . | . | . | . |
| CARX | NEBR | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | T | . | . | . | . | . | . | . | . | . |
| CARX | NEUR | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 2 | . | 1 | . | . | . | . | . |
| CARX | OBOV | . | . | . | . | . | . | . | . | 2 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| CARX | ROST | 7 | 8 | 7 | 8 | 8 | 8 | 7 | 5 | 5 | . | 1 | . | T | 4 | . | T | . | . | T | . | . | T | 3 | . | 2 |
| CARX | SCOP | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | T | 5 | 1 | . | . | . | . | . |
| CARX | SIMI | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 7 | . | . | . | . |
| DESC | CESP | . | . | . | . | . | T | 4 | . | . | . | . | . | . | . | . | T | . | . | T | . | . | T | 1 | T | . |
| ELEO | PALU | . | . | . | . | T | 1 | . | . | . | . | T | . | . | . | . | . | . | . | . | . | . | . | . | 6 | 7 |
| ELEO | PAUC | . | . | . | . | . | . | T | . | . | . | . | . | . | . | . | 1 | . | . | . | . | . | 6 | 5 | . | . |
| GLYC | STRI | 1 | . | . | T | . | . | . | . | . | T | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| HORD | BRAC | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 1 | . | . | . | . | . | . | . |
| JUNC | BALT | 1 | . | . | . | . | . | T | . | T | . | T | . | T | . | . | . | . | . | . | . | 1 | 1 | . | . | . |
| JUNC | ENSI | 1 | . | . | T | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | T | . | . | . |
| JUNC | LONG | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | T | . | . | . | . | . | . | . | . | . |
| MUHL | FILI | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 3 | T | . | 1 |
| PHLE | ALPI | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | T | . | . | . | . | . | . |
| POA | PALU | . | . | T | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| POA | PRAT | . | . | . | . | . | . | . | . | . | . | . | T | . | . | T | T | . | . | . | . | . | . | . | . | . |
| TRIS | WOLF | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 3 | . | . | . | . | . | . |
| ACON | COLU | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | T | 6 | T | . | . | . | . | . |
| ANTE | CORY | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 3 | . | . | . |
| ANTE | ROSE | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 1 | . | . | . | . |
| ARNI | CHAM | . | . | . | . | . | . | . | . | . | . | . | T | . | . | . | T | . | . | . | . | . | . | . | . | . |
| ASTE | EATO | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | T | . |
| ASTE | FOLI | T | . | . | . | . | . | . | . | . | . | . | . | . | . | T | . | T | 1 | 2 | 5 | . | 3 | . | . | . |
| ASTE | OCCI | T | . | . | . | . | . | . | . | . | . | T | . | . | . | 3 | . | . | . | . | . | . | . | . | T | . |
| CAMA | GUAM | . | . | . | . | . | . | . | . | . | . | . | T | T | . | . | . | . | . | . | . | . | . | . | . | . |
| CAST | MINI | T | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| DODE | JEFF | . | . | . | . | . | . | 1 | . | 1 | . | . | T | . | . | . | . | . | T | . | . | 5 | T | T | . | . |
| EPIL | GLAN | T | 1 | T | T | . | . | . | . | . | . | . | . | 1 | . | T | T | T | T | T | T | T | . | . | . | . |
| EQUI | ARVE | . | . | . | T | . | . | . | . | . | . | . | . | . | . | T | . | T | . | . | . | . | . | . | . | . |
| FRAG | VIRG | T | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| GALI | TRFL | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | T | . | . | . | . | . |
| GENT | AFFI | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | T | . | . |
| GEUM | MACR | T | . | 1 | . | . | . | . | . | . | . | . | . | 3 | . | T | . | . | T | . | . | . | . | . | . | . |
| HABE | HYPE | T | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| LIGU | TENU | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | T | T | . | . | T | . | . | . |
| MIMU | GUTT | T | T | . | T | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| MIMU | PRIM | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 1 | . | . | . | . |
| MITE | PENT | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | T | . | . | . | . | . | . | . |
| PEDI | GROE | . | . | . | . | . | . | . | . | T | . | . | . | T | . | . | . | . | . | . | T | 4 | . | T | . | . |
| PENS | GLOB | . | . | . | . | . | . | . | . | T | . | . | . | 2 | . | . | . | . | . | . | . | . | . | . | . | . |
| POLE | OCCE | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 1 | . | . | . | . | . |
| POLY | BIST | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | T | . | . | T | T | . | . | . | . | . |
| POTE | GRAC | . | . | . | . | . | . | . | . | . | . | . | . | 3 | . | . | . | . | . | . | T | T | . | . | . | . |
| RANU | ALIS | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | T | . | 1 | 4 | . | . | . |
| SANG | SITC | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | T | . | 4 | . | . | . | . | . |
| SAXA | OREG | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 5 | . | . | . | . | . | . |
| SENE | INTE | . | . | . | . | . | . | . | . | . | . | . | T | . | . | . | . | . | . | 1 | . | . | . | . | . | . |
| SENE | PSEU | . | . | . | . | . | . | . | . | . | 4 | . | . | 4 | . | . | . | . | . | . | . | . | 1 | . | . | . |
| SENE | TRIA | . | . | . | . | . | . | . | . | . | . | . | . | . | . | T | . | . | . | . | T | . | . | . | . | . |
| SMIL | STEL | . | . | . | . | . | . | . | . | . | 1 | . | . | . | . | T | . | . | . | . | . | . | . | . | . | . |
| SOLI | CANA | T | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| STEL | LONG | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | T | T | . | . | . | . | . |
| THAL | OCCI | . | . | . | . | . | . | . | . | . | 4 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| TRIF | LONG | . | . | T | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 1 | . | . | . |
| URTI | DIOI | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | T | . | . | . | . | . | . | . | . |

| | MECI | | CANE | | | | | SAWO/SWPE-PEER | |
|---|---|---|---|---|---|---|---|---|---|
| | T 1 | WI 1 | NC 12 | NC 5 | MC 6 | WF 2 | NC 20 | NC 16 | NC 19 |
| | 80 | 78 | 62 | 77 | 74 | 76 | 75 | 55 | 50 |
| ABIE LASI | 1 | 2 | . | . | . | . | . | . | . |
| LONI INVO | . | 2 | . | . | . | . | . | . | . |
| POTE FRUT | . | . | . | . | . | . | . | . | T |
| RIBE LACU | . | 2 | . | . | . | . | . | . | . |
| SALX GEYE | . | . | 1 | 1 | . | . | . | . | . |
| SALX MYRT | . | . | T | . | . | . | . | . | . |
| SALX PHYL | . | . | 3 | . | . | . | . | . | . |
| SALX RIGI | . | 1 | . | . | . | . | . | . | . |
| SALX WOLF | . | . | . | . | . | . | . | T | T |
| AGRO CANI | . | . | . | . | . | . | . | . | T |
| AGRS SCAB | . | . | . | . | . | . | . | T | . |
| AGRO THUR | T | . | . | . | . | 5 | . | . | . |
| ALOP ALPI | . | . | 5 | . | . | T | T | 2 | . |
| BROM CILI | . | . | . | . | . | . | . | . | T |
| CALA CANA | . | T | T | T | T | . | . | . | . |
| CARX AQUA | . | . | T | . | . | . | . | 5 | . |
| CARX ATHR | . | . | . | T | . | . | . | . | . |
| CARX DOUG | . | . | . | . | . | . | 1 | . | 4 |
| CARX MICR | . | . | . | . | . | T | . | . | . |
| CARX NEBR | . | . | 2 | 6 | 6 | 3 | 7 | . | 5 |
| CARX ROST | . | . | T | . | . | . | . | 1 | T |
| CARX SIMI | . | . | 1 | . | . | 2 | T | 3 | 1 |
| DESC CESP | . | . | . | 5 | 1 | T | T | . | T |
| DESC ELON | . | . | . | . | . | . | . | . | T |
| ELEO PAUC | . | . | . | 1 | 1 | 1 | . | . | . |
| ELYM GLAU | T | . | . | . | . | . | . | . | . |
| GLYC STRI | 2 | . | . | . | . | . | T | . | . |
| HORD BRAC | . | . | . | 4 | T | T | T | . | . |
| JUNC BALT | . | . | 5 | T | 5 | 2 | 1 | 1 | 1 |
| JUNC ENSI | . | . | . | . | . | 1 | . | . | . |
| JUNC LONG | . | . | T | . | T | . | . | . | . |
| MUHL FILI | . | . | . | . | . | T | T | . | . |
| PHLE ALPI | . | . | . | T | . | . | T | . | T |
| PHLE PRAT | . | . | . | 1 | . | 1 | . | . | . |
| POA PALU | . | . | T | 2 | . | . | . | . | . |
| POA PRAT | . | . | . | T | . | T | T | T | . |
| ACHI MILL | . | . | . | T | . | . | . | . | . |
| ACTA RUBR | . | 2 | . | . | . | . | . | . | . |
| ANGE ARGU | . | T | . | . | . | . | . | . | . |
| ARNI CHAM | . | . | . | T | . | . | . | . | . |
| ASTE EATO | 1 | . | . | . | . | . | . | . | . |
| ASTE FOLI | . | T | . | . | . | . | . | 3 | 6 |
| ASTE OCCI | . | . | T | . | . | . | . | . | . |
| DELF OCCI | . | 1 | . | . | . | . | . | . | . |
| EPIL ANGU | . | T | . | . | . | . | . | . | . |
| EPIL GLAN | T | . | T | T | . | T | T | . | . |
| EQUI ARVE | . | T | 1 | . | . | . | . | . | . |
| FRAG VIRG | . | T | . | . | . | . | T | 3 | T |
| GALI BORE | . | T | . | . | . | . | . | . | . |
| GERA RICH | T | T | . | . | . | . | . | . | . |
| GEUM MACR | T | T | . | . | . | . | T | . | T |
| HABE HYPE | . | . | . | . | . | . | . | T | . |
| HERA LANA | 2 | T | . | . | . | . | . | . | . |
| MERT CILI | 2 | T | . | . | . | . | . | . | . |
| MIMU GUTT | T | . | . | . | . | . | . | . | . |
| OSMO CHIL | 1 | . | . | . | . | . | . | . | . |
| PARN FIBR | . | . | . | . | . | . | 1 | . | . |
| PEDI GROE | . | . | 1 | . | . | 2 | . | 2 | 2 |
| POLE OCCE | . | . | . | . | . | . | 5 | 1 | 4 |
| POTE GRAC | . | . | . | T | . | . | . | . | . |
| RYDB OCCI | 1 | 1 | . | . | . | . | . | . | . |
| SENE SPHA | . | . | . | . | . | . | T | . | 1 |
| SENE TRIA | 6 | 2 | . | . | . | . | . | . | . |
| STEL LONG | . | . | . | . | . | . | T | T | . |
| STRE AMPL | . | 1 | . | . | . | . | . | . | . |
| TARX OFFI | . | . | . | T | . | . | . | T | . |
| THAL OCCI | . | 2 | . | . | . | . | . | . | . |
| TRIF ERIO | . | . | . | T | . | T | . | . | T |
| URTI DIOI | T | . | . | . | . | . | . | . | . |

| | | SAPH / CARO-CAAQ | | | | | | SAGE / CARO-CAAQ | | | | SADR-SAMY / CARO-CAAQ | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | TM 7 | TM 14 | WC 10 | WC 21 | TM 5 | TM 1 | SFS 17 | STM A-1 | MC 5 | DR 3 | WC 9 | COT A-7 | WC 1 | WI 4 | DR 2 | COT A-5 |
| | | 134 | 133 | 63 | 61 | 135 | 136 | 09 | 3 | 10 | 1 | 2 | 40 | 19 | 45 | 44 | 41 |
| ABIE | LASI | . | . | . | . | . | . | . | . | . | . | T | . | . | . | . | . |
| PINU | CONT | . | . | . | T | . | . | . | . | . | . | . | . | . | . | . | . |
| ALNU | INCA | . | . | . | . | . | . | . | . | . | . | T | . | . | . | . | . |
| BETU | GLAN | . | . | T | . | . | . | . | . | . | . | T | . | . | . | . | . |
| LONI | CAER | . | . | . | . | 5 | . | 3 | . | . | . | . | . | . | . | . | . |
| LONI | INVO | . | . | . | . | . | . | . | . | . | . | T | 2 | . | T | T | . |
| POTE | FRUT | . | . | . | . | . | . | . | . | T | . | . | . | . | . | . | . |
| RIBE | INER | . | . | . | . | . | . | . | . | . | 5 | . | . | . | . | . | . |
| RIBE | LACU | . | . | . | . | . | . | . | . | . | . | . | . | . | 1 | 1 | . |
| SALX | EAST | 1 | . | . | . | 1 | 1 | . | . | . | . | . | . | . | . | . | . |
| SALX | DRUM | . | . | . | . | . | . | . | . | . | . | 1 | 5 | 2 | 5 | 6 | 6 |
| SALX | GEYE | . | . | . | . | . | . | 7 | 3 | 6 | 8 | 5 | . | . | . | . | . |
| SALX | MYRT | . | . | . | . | . | . | . | . | . | . | 4 | 4 | 6 | . | . | . |
| SALX | PHYL | 7 | 6 | 6 | 6 | 6 | 7 | . | . | . | . | . | . | . | . | 1 | . |
| SALX | RIGI | . | . | . | . | . | . | . | . | . | . | . | . | . | 4 | . | . |
| AGRS | SCAB | . | . | . | T | . | . | . | . | . | . | . | . | . | . | . | . |
| ALOP | ALPI | . | . | . | T | . | . | . | . | . | . | . | . | . | . | . | . |
| BROM | CILI | . | . | . | . | . | . | . | . | . | . | T | . | . | 1 | . | . |
| CALA | CANA | . | . | . | . | . | . | 1 | . | . | . | . | . | . | . | . | T |
| CALA | INEX | . | . | . | . | . | . | . | . | T | . | . | . | . | . | . | . |
| CARX | AQUA | 6 | 6 | T | 1 | 1 | 1 | 5 | . | . | . | 4 | 4 | 1 | . | . | . |
| CARX | ATHR | . | . | . | . | . | . | . | . | . | . | . | . | . | T | T | . |
| CARX | DOUG | . | . | T | T | . | . | . | . | . | . | . | . | . | . | . | . |
| CARX | LANU | . | . | . | . | . | . | . | . | T | . | . | . | . | . | . | . |
| CARX | MICR | . | . | . | . | . | . | . | . | 2 | . | . | . | . | . | . | . |
| CARX | NEBR | . | . | . | T | . | . | . | . | 1 | . | . | . | . | . | . | . |
| CARX | ROST | 2 | T | 7 | 6 | 5 | 4 | . | 5 | 4 | 6 | 6 | 5 | 6 | 5 | 7 | 7 |
| CARX | SIMI | . | . | . | T | . | . | . | . | . | . | . | . | . | . | . | . |
| DESC | CESP | . | 4 | . | . | T | T | . | T | T | . | . | . | . | . | . | . |
| DESC | ELON | . | . | . | . | . | . | . | . | . | . | . | T | . | . | . | . |
| ELEO | PALU | . | . | . | T | . | . | . | T | . | . | . | . | . | . | . | . |
| ELEO | PAUC | . | . | . | . | 1 | . | . | . | . | . | . | . | . | . | . | . |
| GLYC | STRI | . | . | . | . | . | . | . | . | 5 | 1 | . | . | . | 3 | . | . |
| HORD | BRAC | . | . | . | . | . | . | . | . | T | . | . | . | . | . | . | . |
| JUNC | BALT | . | . | . | T | . | . | . | . | . | . | . | . | . | . | . | . |
| JUNC | ENSI | . | . | . | . | . | . | . | . | T | . | . | . | . | T | 1 | . |
| JUNC | LONG | . | . | . | . | . | . | . | . | . | . | T | . | . | . | . | . |
| PHLE | PRAT | . | . | . | . | . | . | . | . | T | . | . | . | . | . | . | . |
| POA | PALU | . | . | . | . | . | . | . | . | 2 | . | T | . | . | . | . | . |
| POA | PRAT | . | . | . | . | . | . | . | . | 1 | . | T | . | . | . | . | . |
| ACON | COLU | . | . | . | . | . | . | T | . | . | . | . | . | . | . | . | . |
| ANTE | ROSE | . | . | . | . | T | . | . | . | . | . | . | . | . | . | . | . |
| ARNI | CHAM | . | . | . | . | . | . | T | . | . | . | . | . | . | . | . | . |
| ASTE | EATO | . | . | . | . | . | . | . | 3 | . | . | . | . | . | . | 1 | . |
| ASTE | FOLI | . | 3 | . | . | 3 | 5 | . | . | 3 | . | T | . | . | 1 | . | . |
| ASTE | INTE | . | . | . | . | . | . | . | . | . | . | 1 | . | . | . | . | . |
| ASTE | MODE | . | . | . | . | . | . | . | . | . | . | . | 1 | T | . | . | T |
| CAMA | GUAM | . | . | . | . | . | . | T | . | . | . | . | . | . | . | . | . |
| CAST | MINI | . | . | . | . | . | . | . | . | . | . | T | . | . | . | . | . |
| DODE | JEFF | . | 2 | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| EPIL | ANGU | . | . | T | . | . | . | . | . | . | . | T | T | . | . | . | T |
| EPIL | GLAN | . | . | T | . | . | . | . | . | T | 1 | . | . | T | . | . | . |
| EQUI | ARVE | . | . | . | . | . | . | . | . | . | . | . | . | T | 3 | 2 | . |
| FRAG | VIRG | . | . | . | . | . | . | T | . | . | . | . | . | . | T | . | . |
| GALI | TRFL | . | . | . | . | . | . | . | . | . | . | . | . | . | 1 | . | . |
| GENT | AFFI | . | . | . | . | . | . | T | . | . | . | . | . | . | . | . | . |
| GEUM | MACR | . | . | . | T | . | . | . | . | 2 | 1 | T | . | T | T | . | . |
| HERA | LANA | . | . | . | . | . | . | . | . | . | . | . | . | T | . | . | . |
| LIGU | TENU | . | 1 | . | . | 2 | . | T | . | . | . | . | . | . | . | . | . |
| MENT | ARVE | . | . | . | . | . | . | . | . | 3 | 1 | . | . | . | . | . | . |
| MIMU | GUTT | . | . | . | . | . | . | . | . | . | 1 | . | . | . | . | . | . |
| MIMU | PRIM | . | . | . | . | T | . | . | . | . | . | . | . | . | . | . | . |
| MITE | PENT | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | T |
| PARN | FIBR | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | T |
| PEDI | GROE | . | T | . | T | 1 | . | T | . | . | . | . | . | . | . | . | . |
| PENS | GLOB | . | . | . | . | . | 5 | . | . | . | . | . | . | . | . | . | . |
| POTE | GRAC | . | . | . | . | . | . | T | . | . | . | . | . | . | . | . | . |
| PYRO | ASAR | . | . | . | 1 | . | . | . | . | . | . | T | . | . | 1 | . | . |
| RANU | ALIS | . | T | . | . | . | . | 1 | . | . | . | . | . | . | . | . | . |
| SENE | SUBN | . | . | . | . | . | . | 1 | . | . | . | . | . | . | . | . | . |
| SENE | INDE | . | . | . | . | . | . | . | . | T | . | . | . | . | . | . | . |
| SOLI | CANA | . | . | . | . | . | . | T | . | . | 1 | . | . | . | . | T | . |
| STEL | LONG | . | . | . | . | . | . | . | . | . | . | T | . | . | . | . | . |
| SWER | PERE | . | . | . | . | T | . | . | . | . | . | . | . | . | . | . | . |
| THAL | FEND | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | T |

| | SAWO-SAEA / MESIC HERB | | | | | | | | | SALX-BEGL / CARX-JUNC | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | JC 6 | H 2 | COT 4 | H 6 | H 5 | COT 7 | COT 9 | TM 8 | JC 4 | JC 16 | JC 8 | JC 12 | JC 15 | WL 2 | JC 18 | COT 2 |
| | 12 | 13 | 5 | 14 | 9 | 11 | 10 | 15 | 126 | 20 | 114 | 113 | 19 | 117 | 116 | 61 |
| FINO CONT | . | . | . | . | . | . | . | . | . | . | . | 1 | . | T | 1 | . |
| BE G GLAN | . | . | . | . | . | . | . | . | . | T | 6 | 4 | 1 | 6 | 6 | 6 |
| LONI CAER | 1 | . | . | . | . | . | . | . | 3 | 4 | 4 | 1 | 1 | 1 | . | . |
| LONI INVO | . | . | . | T | . | . | . | . | . | . | . | . | . | . | . | T |
| POTE FRUT | 1 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| RIBE LACU | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 3 |
| SALX EAST | T | . | . | . | . | . | . | T | 6 | . | . | . | . | . | . | . |
| SALX GEYE | . | . | . | . | . | . | . | . | . | . | T | 3 | . | . | . | . |
| SALX MYRT | . | . | . | 1 | 3 | . | . | . | . | . | T | 2 | . | . | T | 4 |
| SALX PHYL | . | . | . | . | . | . | . | . | . | . | . | 2 | 6 | 3 | 2 | . |
| SALX WOLF | 6 | 7 | 6 | 7 | 4 | 7 | 7 | . | . | 5 | 3 | . | 2 | T | 3 | . |
| VACC OCCI | . | . | . | . | . | . | . | . | . | . | . | 4 | T | 2 | 3 | . |
| AGRO CANI | . | T | T | T | T | T | T | 1 | . | . | . | . | . | . | . | 1 |
| AGRS SCAB | . | . | . | . | . | . | . | . | . | . | . | . | . | . | T | . |
| AGRO THUR | . | . | . | . | . | . | . | . | . | T | . | . | . | . | . | . |
| ALOP ALPI | . | T | . | . | . | 2 | T | . | . | . | . | . | . | . | . | . |
| BROM CARI | 1 | . | . | . | T | . | . | . | . | . | . | . | . | . | . | . |
| BROM CILI | . | 2 | T | T | . | 1 | 1 | . | 1 | . | . | . | . | . | . | T |
| CALA CANA | 1 | . | . | . | . | 6 | 4 | 7 | 4 | . | 1 | 1 | 1 | 3 | 3 | T |
| CARX AQUA | 4 | . | . | T | 1 | . | 2 | T | . | . | 2 | 1 | . | . | . | . |
| CARX ATHR | . | . | . | T | . | . | . | . | . | . | . | . | . | . | . | . |
| CARX BUXB | . | . | . | . | . | . | . | . | . | . | . | . | T | 5 | . | . |
| CARX LEPO | . | . | . | . | . | . | . | . | . | . | T | . | . | . | . | . |
| CARX LUZU | . | . | . | . | . | . | . | T | . | . | . | 1 | . | . | T | . |
| CARX MICR | . | . | . | . | 1 | T | T | . | . | . | . | . | . | T | . | . |
| CARX ROST | . | . | T | T | . | 1 | T | . | . | . | . | . | T | . | . | . |
| CARX SCOP | . | . | . | . | . | . | . | T | 2 | . | . | . | . | . | . | . |
| DANT INTE | . | . | . | . | . | . | . | . | . | . | T | . | . | . | . | . |
| DESC CESP | 4 | . | T | . | . | . | T | . | . | 2 | . | 4 | . | 1 | T | . |
| DESC ELON | . | . | T | . | . | 1 | . | . | . | . | . | . | . | . | . | 1 |
| ELYM GLAU | . | T | T | . | . | . | . | . | . | . | . | . | . | . | . | T |
| GLYC STRI | . | . | . | . | 3 | . | . | . | . | . | . | . | . | . | . | . |
| JUNC BALT | T | T | . | 4 | T | T | T | . | . | 2 | . | . | . | . | . | . |
| JUNC ENSI | . | . | . | 2 | . | . | T | . | . | . | . | . | . | . | . | . |
| JUNC LONG | . | . | . | 1 | 3 | . | . | . | . | . | . | . | . | T | T | . |
| LUZU CAMP | . | . | . | . | . | . | . | . | . | 1 | T | T | . | . | . | . |
| MELI SPEC | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | T |
| MUHL FILI | . | . | . | . | . | . | . | . | . | . | . | 5 | . | . | . | . |
| PHLE ALPI | . | . | . | T | T | . | T | . | . | . | . | . | . | . | . | . |
| PHLE PRAT | . | 1 | 2 | 1 | 1 | . | . | . | . | . | . | . | . | . | . | T |
| POA INTE | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 3 |
| POA PALU | . | 2 | . | 1 | 4 | . | . | . | . | . | . | . | . | . | T | . |
| POA PRAT | . | T | 2 | . | T | . | . | . | . | . | . | . | . | . | . | T |
| TRIS WOLF | . | . | . | . | . | . | . | T | 2 | . | . | . | . | . | . | . |
| ACHI MILL | T | 2 | T | 1 | T | T | T | 1 | 1 | T | . | . | . | . | . | 1 |
| ACON COLU | . | . | . | . | . | . | . | 1 | 2 | . | . | . | T | T | 3 | . |
| AGOS GLAU | . | T | T | T | . | . | . | . | . | . | . | . | . | . | . | . |
| ANGE ARGU | . | . | . | . | . | . | T | . | . | . | . | . | . | . | . | 3 |
| ANTE CORY | T | . | . | . | . | . | . | . | . | 3 | 2 | 1 | T | . | . | . |
| ARNI CHAM | . | . | T | . | . | T | . | . | . | . | . | . | . | . | . | T |
| ASTE FOLI | . | T | 5 | T | . | T | 5 | 1 | T | . | . | T | . | 1 | 4 | 1 |
| ASTE INTE | . | . | . | . | . | . | . | . | . | 4 | . | . | . | . | . | . |
| ASTR ALPI | . | . | . | 1 | T | . | . | . | . | . | . | . | . | . | . | . |
| CALT BICO | . | . | . | . | . | . | . | . | . | . | . | 2 | 1 | . | 3 | . |
| CAST MINI | . | 1 | T | T | 1 | . | 1 | . | . | . | . | . | . | . | . | T |
| DODE JEFF | T | . | . | . | . | . | . | . | T | . | . | 1 | 1 | 1 | 3 | . |
| EPIL ANGU | . | . | T | . | . | T | T | . | . | . | . | . | . | . | . | . |
| EPIL GLAN | . | . | . | . | T | . | . | . | . | . | . | . | . | . | . | 1 |
| EQUI ARVE | . | . | T | 1 | 5 | . | . | . | . | . | . | . | . | T | . | 1 |
| FRAG VIRG | . | 5 | 5 | 2 | 1 | . | 1 | . | T | T | T | . | 1 | 1 | 1 | 1 |
| GALI BORE | . | T | 1 | T | 1 | T | T | . | . | . | . | . | . | . | . | . |
| GENT AFFI | T | . | . | . | . | . | . | . | . | 3. | . | . | . | . | T | . |
| GERA RICH | . | . | . | T | . | . | . | . | . | . | . | . | . | . | . | 1 |
| GERA VISC | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | T |
| GEUM MACR | . | . | . | . | . | T | . | 3 | T | . | . | . | . | T | . | T |
| HABE HYPE | . | . | . | T | T | . | . | . | . | . | . | . | . | 1 | T | . |
| HERA LANA | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 1 |
| LIGU TENU | 1 | . | . | . | . | . | . | T | . | T | T | . | 1 | T | T | . |
| MIMU GUTT | . | . | . | T | T | . | . | . | . | . | . | . | . | . | . | . |
| MONT CORD | . | . | . | . | . | . | . | . | T | . | . | . | . | . | . | . |
| PEDI GROE | T | . | . | T | 2 | . | T | . | . | . | T | . | . | 1 | T | . |
| PENS GLOB | 1 | . | . | . | . | . | . | T | . | . | . | . | . | . | . | . |
| PERI GAIR | . | T | T | . | . | T | . | . | . | . | . | . | . | . | . | T |
| POLE OCCE | . | . | . | T | 2 | . | . | . | T | . | . | . | . | . | . | . |
| POLY BIST | 1 | . | . | . | . | . | . | . | 2 | . | . | . | . | . | . | . |
| POTE GRAC | 2 | T | 2 | . | T | T | T | . | . | . | 1 | . | . | . | . | T |
| PRUN VULG | . | . | . | . | 3 | . | . | . | . | . | . | . | . | . | . | T |
| PYRO ASAR | . | . | . | T | T | . | T | . | . | . | . | . | . | . | . | . |
| RANU ALIS | 1 | . | . | . | . | . | . | T | . | 3 | 2 | 1 | 2 | . | 1 | . |
| RYDB OCCI | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 1 |
| SANG SITC | 2 | . | . | . | . | . | . | 3 | 3 | . | 1 | 1 | . | . | . | . |
| SAXA OREG | 3 | . | T | . | . | . | . | . | . | . | 1 | . | 1 | T | T | . |
| SENE PSEU | . | . | . | . | . | . | . | . | 1 | . | . | . | . | 1 | . | . |
| SENE SPHA | . | T | . | . | . | 4 | 4 | . | . | . | . | . | . | . | . | . |
| SENE SUBN | . | . | . | . | . | . | . | . | . | 1 | . | T | T | . | . | . |
| SENE TRIA | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 1 |
| SENE INDE | . | . | . | T | T | . | . | . | . | . | . | . | . | . | . | . |
| SMIL STEL | . | T | 1 | T | 1 | T | 2 | . | . | . | . | . | . | . | . | T |
| SOLI CANA | . | 1 | T | T | . | . | . | . | . | . | . | . | . | . | . | 1 |
| SPIR DENS | . | . | . | . | . | . | . | . | . | . | . | . | . | T | T | . |
| SPIR ROMA | . | . | . | . | . | . | T | . | . | . | . | . | . | . | . | . |
| STEL LONG | . | . | . | T | T | . | . | . | . | . | . | . | . | . | . | . |
| SWER PERE | . | . | . | . | . | . | . | . | . | . | T | . | . | 3 | T | . |
| TARA OFFI | . | T | T | . | . | . | . | . | . | . | . | . | . | . | . | . |
| THAL FEND | . | . | . | . | . | . | T | . | . | . | . | . | . | . | . | . |
| THAL OCCI | . | 1 | . | . | . | . | . | . | . | . | . | . | . | . | . | 1 |

| | SAEA Group / CASC | | | | SAEA / CARO - CAAQ | | | | | | SAWO - BEGL / CARO - CAAQ | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | TM 3 | TM* 9 | TM 2 | DW 2 | JC 13 | DW 6 | JC 3 | SFS 13 | SFS 15 | JC 17 | COT 1-9 | SFS 10 | SFS 11 | COT 5 | BT 3 |
| | 128 | 115 | 127 | 132 | 24 | 130 | 30 | 121 | 131 | 125 | 48 | 112 | 119 | 59 | 58 |
| PICE ENGL | . | T | . | T | . | . | . | . | . | . | . | . | . | . | . |
| PINU CONT | . | T | . | . | . | . | . | . | . | . | . | . | . | . | . |
| BETU GLAN | 3 | 5 | 4 | . | 1 | . | . | . | T | . | 5 | 5 | 5 | 5 | 5 |
| LONI CAER | . | 4 | 2 | T | 4 | . | . | 3 | T | T | . | . | T | . | . |
| LONI INVO | . | . | . | . | . | . | . | . | . | . | . | . | . | T | T |
| SALX EAST | 7 | . | 5 | 5# | 6 | 6 | 6 | 7 | 6 | 1 | . | 5 | . | . | . |
| SALX DRUM | . | . | . | T | . | . | . | . | . | 5 | . | . | . | . | . |
| SALX GEYE | . | . | . | . | . | . | . | . | . | . | . | 6 | . | . | . |
| SALX MYRT | . | . | . | . | . | . | . | . | . | . | 3 | . | 4 | . | 3 |
| SALX PHYL | T | T | 3 | 1 | 4 | 4 | . | 1 | 1 | T | . | . | T | . | . |
| SALX RIGI | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 4 |
| SALX WOLF | . | 1 | . | T | . | . | . | . | . | 5 | 6 | . | . | 5 | 4 |
| VACC OCCI | . | 5 | . | . | . | . | . | . | . | . | . | . | . | . | . |
| BROM CILI | . | . | . | . | . | . | . | . | . | . | . | . | . | . | T |
| CALA CANA | 6 | . | . | 1 | T | . | 1 | . | . | 4 | . | T | . | . | T |
| CARX AQUA | . | . | . | T | 6 | 7 | 5 | 1 | 2 | 6 | . | 5 | 5 | . | . |
| CARX JONE | . | . | T | . | . | . | . | . | . | . | . | . | . | . | . |
| CARX LEPO | . | . | . | . | . | . | 1 | . | . | . | . | . | . | . | . |
| CARX LUZU | . | 1 | 2 | T | . | T | . | . | . | . | . | . | . | . | . |
| CARX MICR | . | 1 | T | 1 | . | . | . | . | . | . | . | . | . | . | . |
| CARX NEUR | . | . | . | T | . | . | . | . | . | . | . | . | . | . | . |
| CARX OBOV | T | T | 4 | 2 | . | . | . | . | . | . | . | 1 | 5 | . | . |
| CARX ROST | . | . | . | . | . | 1 | . | 5 | 6 | 4 | 6 | 5 | 3 | 7 | 6 |
| CARX SCOP | 1 | 3 | 5 | 3 | . | . | . | . | . | . | . | . | . | . | . |
| DESC CESP | . | T | T | . | . | . | . | 1 | . | 1 | . | . | . | . | . |
| HORD BRAC | . | . | . | . | . | . | T | . | . | . | . | . | . | . | . |
| JUNC BALT | . | . | . | T | . | . | . | T | T | . | . | . | T | . | . |
| JUNC ENSI | . | . | . | . | . | . | . | . | . | . | . | . | . | . | T |
| JUNC LONG | . | . | . | 1 | . | . | . | . | . | . | . | . | . | . | . |
| LUZU CAMP | . | . | . | . | . | . | . | . | . | T | . | . | . | . | . |
| PHLE ALPI | . | . | . | . | . | . | . | 1 | . | . | . | . | . | . | . |
| POA PALU | . | T | . | . | . | . | . | . | . | . | . | . | . | . | . |
| TRIS WOLF | . | . | . | . | . | . | . | T | . | . | . | . | . | . | . |
| ACHI MILL | . | T | . | . | . | . | T | T | . | . | . | . | . | . | . |
| ACON COLU | . | . | . | T | . | . | . | . | . | . | . | . | . | . | . |
| ANTE CORY | . | . | . | . | T | . | . | . | . | . | . | . | . | . | . |
| ANTE ROSE | . | T | T | . | . | . | . | 1 | . | . | . | . | . | . | . |
| ARNI CHAM | . | . | . | . | . | . | . | . | . | T | . | . | . | . | . |
| ASTE FOLI | 2 | 1 | . | . | . | T | T | . | . | . | . | . | . | T | 1 |
| ASTE MODE | . | . | . | . | . | . | . | . | . | . | . | . | . | T | . |
| ASTE OCCI | . | . | 1 | T | . | . | . | . | . | . | . | . | . | . | . |
| CALT BICO | . | 1 | 2 | . | . | . | T | . | . | . | . | . | . | . | . |
| CAMA QUAM | . | . | . | . | . | . | . | T | . | . | . | . | . | . | . |
| DODE JEFF | . | . | . | 1 | . | . | T | T | . | . | . | . | . | . | . |
| EPIL ANGU | . | . | . | . | . | . | . | . | . | . | . | . | . | T | . |
| EQUI ARVE | T | T | T | 5 | T | T | T | . | . | . | . | . | . | T | 4 |
| FRAG VIRG | T | T | . | T | . | . | . | T | . | . | 1 | . | . | T | . |
| GALI BORE | . | . | . | . | . | . | . | . | . | . | . | . | . | T | . |
| GALI TRFL | . | . | . | . | . | . | . | . | . | . | . | . | . | . | T |
| GENT AFFI | . | . | . | . | . | . | T | . | . | . | . | . | . | . | . |
| GEUM MACR | 1 | . | . | . | . | . | T | . | . | T | . | . | . | . | . |
| LIGU CANB | . | . | . | 1 | . | . | . | . | . | . | . | . | . | . | . |
| LIGU TENU | 1 | 1 | 2 | . | T | . | . | 1 | . | . | . | . | 1 | . | . |
| MIMU PRIM | T | T | 2 | . | . | . | . | . | . | . | . | . | T | . | . |
| MONT CORD | . | . | . | T | . | . | . | . | . | . | . | . | . | . | . |
| PARN FIBR | . | . | . | . | . | . | . | . | . | . | . | . | . | T | T |
| PEDI GROE | . | . | T | . | T | . | T | 1 | . | 1 | . | . | . | . | . |
| PENS GLOB | . | . | . | . | . | . | . | T | . | T | . | . | . | . | . |
| POLE OCCE | . | . | . | 1 | . | . | . | . | . | . | . | . | . | . | . |
| POLY BIST | . | . | . | . | . | . | T | T | . | T | . | . | . | . | . |
| POTE GRAC | . | T | . | . | . | . | T | T | . | . | . | . | . | . | . |
| RANU ALIS | . | . | . | . | 1 | . | T | T | . | T | . | . | . | . | . |
| RYDB OCCI | . | . | . | . | . | . | . | . | . | . | . | . | . | . | T |
| SANG SITC | . | . | . | T | T | . | T | . | . | T | . | . | . | . | . |
| SAXA OREG | . | . | . | . | . | . | . | . | . | . | . | . | T | . | . |
| SENE INTE | . | . | . | . | T | . | . | . | . | . | . | . | . | . | . |
| SENE PSEU | . | 1 | . | T | . | . | . | . | . | . | . | . | . | . | . |
| SENE SPHA | . | . | . | . | . | . | . | . | . | . | 1 | . | . | . | . |
| SENE SUBN | . | . | T | . | T | . | . | . | . | . | . | . | . | . | . |
| SMIL STEL | . | . | . | . | . | . | . | . | . | . | 1 | . | . | T | . |
| SOLI CANA | . | . | . | T | . | . | . | . | . | . | T | . | . | . | . |
| SPIR ROMA | . | T | . | . | . | . | . | . | . | . | . | . | . | . | . |
| SWER PERE | . | 1 | 2 | T | . | . | . | . | . | . | . | . | . | . | . |
| THAL FEND | . | . | . | . | . | . | . | . | . | . | . | . | . | . | T |
| TRIF LONG | . | . | . | . | . | . | . | T | . | . | . | . | . | . | . |

* SALX comm  # variant — SALX EAST absent

| | SADR - SAMY / COST - TALL FORB | | | | | | | | | SADR - SAMY / CACA | | | SADR-SARI / EQAR | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | WI 6 | WI 8 | WI 9 | WI 14 | WDR 6 | WC 7 | COT A-1 | H 1 | WI 3 | JC 2 | WC 11 | COT 3 | WI 2 | T 4 | T 3 | T 6 | KC 1 | T 2 | DT 2 | T 5 | WC 14 |
| [illegible] | | | | | | | 22 | 3 | | | | | | | | | | | | | |
| [illegible] | | | | | | | | | | | | | | | | | | | | | |
| [illegible] | | | | | | | | | | | | | | | | | | | | | |
| [illegible] | | | | | | | |

| | SAMY/ POPR | | SAGE-SAMY/ DRY CORRIDOR | | | | SAGE / POPA | | | | | SAGE/ CACA | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | NC | H | COT | COT | WC | WC | WDR | WI | WC | WC | STM | BC | COT | WC |
| | 4 | 4 | 8 | 1 | 18 | 16 | 7 | 11 | 15 | 3 | 5 | 2 | 6 | 13 |
| | 57 | 23 | 24 | 15 | 14 | 22 | 4 | 13 | 8 | 7 | 5 | 11 | 12 | 6 |
| PINU CONT | . | . | . | . | . | . | . | . | . | . | 1 | . | . | . |
| BETU GLAN | 5 | . | . | . | . | . | . | . | . | . | . | . | . | . |
| LONI INVO | T | . | . | . | . | . | . | . | . | 1 | . | . | . | . |
| POTE FRUT | 2 | . | . | . | . | . | . | . | . | . | . | . | . | . |
| RIBE INER | . | . | . | . | . | . | . | . | . | 1 | . | . | . | . |
| RIBE LACU | T | . | . | 5 | 6 | . | . | . | . | . | . | . | 1 | . |
| ROSA SP | T | . | . | . | 5 | 2 | . | . | . | 1 | . | . | . | . |
| SALX DRUM | . | . | . | . | . | . | . | . | 2 | . | . | 5 | . | . |
| SALX GEYE | 3 | . | . | 5 | 5 | . | 7 | 5 | 6 | 6 | 6 | 6 | 7 | 7 |
| SALX BARC | . | . | . | . | . | . | . | . | . | . | . | 1 | . | . |
| SALX MYRT | 5 | 6 | 5 | 4 | 2 | 5 | . | 1 | 5 | 3 | . | 2 | . | . |
| SALX RIGI | . | . | . | . | . | . | . | . | T | . | . | . | . | . |
| SALX LASI | . | . | . | . | . | . | . | . | 1 | . | . | . | . | . |
| AGRO CANI | . | . | . | . | T | T | . | 1 | . | . | 1 | . | . | . |
| ALOP ALPI | . | . | T | . | T | . | T | . | . | . | T | . | T | 6 |
| BROM CARI | . | . | . | 1 | T | 2 | . | 1 | . | . | . | . | . | . |
| BROM CILI | T | 1 | 1 | . | . | . | . | . | . | . | . | . | T | T |
| CALA CANA | . | . | T | . | . | . | T | . | . | T | . | 7 | . | 5 |
| CALA INEX | . | . | . | . | . | . | . | . | . | . | . | . | 4 | . |
| CARX AGUA | . | . | . | . | . | . | . | T | 1 | T | . | T | . | . |
| CARX ATHR | . | . | 1 | . | . | . | 1 | . | . | T | T | . | . | T |
| CARX DOUG | . | . | . | . | . | . | . | . | . | . | . | . | . | T |
| CARX MICR | . | . | . | . | . | . | 1 | T | . | . | . | . | . | . |
| CARX OBOV | . | . | . | . | . | . | . | . | . | . | T | . | . | . |
| CARX ROST | . | . | . | . | . | . | T | . | 2 | . | . | 2 | . | T |
| DESC CESP | . | . | . | . | . | . | . | . | . | . | 3 | . | . | . |
| DESC ELON | . | . | T | . | . | . | . | . | . | . | . | . | T | . |
| ELYM GLAU | . | T | 2 | T | . | . | . | . | . | . | . | . | T | . |
| GLYC STRI | T | . | . | . | . | . | . | . | 4 | T | . | . | . | 1 |
| HORD BRAC | . | . | . | . | . | T | . | T | . | . | T | . | . | T |
| JUNC BALT | . | . | . | . | . | T | . | T | T | . | . | . | . | T |
| JUNC ENSI | . | . | . | . | . | . | 3 | . | . | 1 | . | . | . | T |
| JUNC LONG | . | . | T | . | . | . | . | . | . | . | . | . | . | . |
| MELI SPEC | . | . | . | T | . | . | . | . | . | . | . | . | . | . |
| PHLE ALPI | . | T | . | . | . | T | 1 | . | T | . | . | . | . | . |
| PHLE PRAT | . | . | 1 | 5 | 2 | 1 | . | 1 | . | T | . | . | . | . |
| POA PALU | T | 1 | . | . | T | T | 5 | 5 | 5 | 6 | 5 | 1 | T | 2 |
| POA PRAT | 6 | 1 | . | T | T | 3 | T | 3 | T | T | . | . | . | . |
| TRIS WOLF | . | . | . | . | . | . | 3 | . | . | . | 1 | . | . | . |
| ACHI MILL | T | T | 1 | 1 | T | 3 | 1 | T | T | T | . | . | . | . |
| AGOS GLAU | . | T | . | T | . | . | . | . | . | 1 | . | . | . | . |
| ANGE ARGU | . | . | 4 | . | . | . | . | . | . | . | . | . | . | . |
| ANTE ROSE | T | . | . | . | . | . | . | . | . | . | . | . | . | . |
| ARNI CHAM | . | . | T | T | . | T | . | . | . | 1 | 4 | . | T | 1 |
| ASTE EATO | . | . | . | . | . | . | . | . | . | . | 2 | . | . | . |
| ASTE FOLI | 2 | T | 1 | T | T | . | . | T | T | . | . | . | T | 3 |
| ASTE INTE | . | . | . | 1 | . | T | . | . | . | . | . | . | . | . |
| ASTE OCCI | . | . | . | . | . | T | . | . | . | . | . | . | . | . |
| ASTR ALPI | . | 3 | . | . | T | . | . | . | . | . | . | . | . | . |
| ASTR DASY | . | . | . | . | . | 3 | . | . | . | . | . | . | . | . |
| CAMA QUAM | . | . | T | . | . | . | 1 | . | . | . | . | . | . | . |
| CAST MINI | T | 4 | 1 | T | . | T | . | 1 | T | T | . | . | 1 | 1 |
| CICU DOUG | . | 1 | . | . | . | . | . | . | . | . | . | . | . | . |
| EPIL ANGU | . | . | . | T | T | . | . | 1 | . | T | . | . | T | . |
| EPIL GLAN | T | . | . | . | . | . | T | T | T | T | . | T | . | . |
| EQUI ARVE | . | T | T | . | T | 3 | . | . | . | T | . | . | . | . |
| FRAG VIRG | 1 | 3 | 1 | 2 | 2 | 5 | . | 3 | T | T | T | . | T | . |
| GALI BORE | T | 1 | T | 1 | T | 1 | . | . | . | T | . | . | T | T |
| GENT AFFI | T | . | . | . | . | . | . | . | . | . | . | . | . | . |
| GERA RICH | . | . | 3 | . | . | T | 1 | . | . | . | . | . | . | . |
| GERA VISC | . | T | . | 2 | 3 | 1 | . | . | . | . | . | . | . | . |
| GEUM MACR | 3 | . | T | . | . | . | 1 | T | T | T | T | T | . | . |
| HABE HYPE | . | . | . | . | . | . | T | . | . | . | . | . | . | . |
| HERA LANA | . | . | T | T | . | T | . | . | . | . | . | . | . | . |
| LIGU FILI | . | . | 1 | 1 | . | . | . | . | . | . | . | . | . | . |
| LUPI POLY | . | . | . | 1 | . | . | . | . | . | . | . | . | . | . |
| MENT ARVE | . | . | . | . | . | . | . | . | . | 1 | . | 1 | . | . |
| PEDI GROE | . | T | . | . | . | . | 1 | . | . | . | . | . | . | T |
| PERI GAIR | . | . | T | 2 | T | 2 | . | T | . | T | . | . | T | T |
| POTE GRAC | T | . | 3 | 6 | 2 | 2 | 2 | 2 | T | T | 1 | . | 1 | T |
| PRUN VULG | T | T | T | . | . | T | . | . | . | T | T | . | . | . |
| RANU UNCI | . | . | T | . | . | . | . | T | T | . | T | . | . | . |
| RYDB OCCI | . | . | T | . | . | . | . | . | . | . | . | . | T | . |
| SANG SITC | . | . | . | . | . | . | . | . | T | . | . | . | . | . |
| SAXA OREG | . | . | . | . | . | . | T | . | . | . | . | . | . | . |
| SENE HYDR | . | . | . | . | . | . | . | . | . | . | . | . | . | 5 |
| SENE INTE | . | . | . | . | . | . | 4 | . | . | . | . | . | . | . |
| SENE SERR | . | . | . | T | . | T | . | . | . | . | . | . | . | . |
| SENE SPHA | T | . | . | . | . | . | . | . | . | . | . | . | . | . |
| SENE INDE | . | 1 | . | . | . | . | . | . | . | . | . | . | . | . |
| SMIL STEL | T | 1 | T | . | T | T | T | . | . | . | . | . | T | . |
| SOLI CANA | T | 3 | T | 1 | . | T | 1 | 3 | . | . | . | . | T | . |
| STEL LONG | . | T | . | . | . | . | . | . | T | T | T | . | . | . |
| TARX OFFI | . | . | T | . | 2 | 4 | . | . | 1 | . | 1 | . | . | . |
| THAL FEND | T | . | T | . | T | . | . | . | . | . | . | . | . | . |
| THAL OCCI | . | 1 | . | 3 | . | 1 | . | . | 1 | . | . | . | . | . |
| TRIF ERIO | . | 2 | T | T | T | 2 | . | . | . | T | 2 | . | . | . |
| TRIF REPE | . | 1 | . | . | . | . | . | . | . | T | . | . | . | . |
| URTI DIOI | . | . | . | . | . | . | . | . | . | T | . | . | . | . |
| VALE OCCI | . | 1 | . | . | . | T | . | . | . | . | . | . | . | . |
| WHET HELI | . | . | . | . | . | 1 | . | . | . | . | . | . | . | . |
| ZIZI APTE | . | T | . | . | . | . | . | . | . | . | . | . | . | . |

## MISCELLANEOUS

| | AC 3 | AC 1 | WI 13 | SFS 21 | WI 5 | SFS 24 | TM 11 | SFS 6 | SFS 9 | JC 7 | WI 7 | WI 12 | WBR 5 | SFS 19 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 19 | 16 | 81 | 158 | 79 | 151 | 152 | 160 | 145 | 111 | 38 | 21 | 9 | 118 |
| PICE ENGL | . | . | . | . | 4 | . | . | . | . | . | 4 | 4 | . | . |
| PINU CONT | . | . | . | . | . | . | . | . | 6 | . | . | . | . | 1 |
| BETU GLAN | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| CORN STOL | . | . | . | . | . | . | . | . | . | . | 6 | . | . | . |
| LONI CAER | . | . | . | . | . | . | . | . | . | T | . | . | . | 2 |
| LONI INVO | . | . | . | T | 6 | . | . | . | . | . | . | . | . | 2 |
| POTE FRUT | T | T | . | . | . | . | . | . | . | . | . | . | . | . |
| RIBE INER | . | . | . | . | . | . | . | . | . | . | . | 1 | 2 | . |
| RIBE LACU | . | . | . | . | . | . | . | . | . | . | 2 | . | T | . |
| ROSA SP | 1 | . | . | . | . | . | . | . | . | . | 2 | . | T | . |
| SALX EAST | . | . | . | . | . | 1 | 1 | . | . | . | . | . | . | T |
| SALX DRUM | . | . | 1 | . | . | . | . | . | . | 5 | 5 | 3 | . | . |
| SALX EXIG | . | . | T | . | . | . | . | . | . | . | . | . | . | . |
| SALX GEYE | 1 | . | . | . | . | . | . | . | . | 4 | . | . | 6 | . |
| SALX MYRT | 5 | 5 | 1 | . | . | . | . | . | . | 1 | 3 | 4 | 3 | . |
| SALX PHYL | . | 1 | . | . | . | . | . | . | . | . | . | . | . | . |
| SALX RIGI | 4 | . | . | . | . | . | . | . | . | . | . | . | . | . |
| SALX LASI | . | . | 1 | . | . | . | . | . | . | . | . | 2 | . | . |
| AGRO CANI | T | . | . | . | . | . | . | . | . | . | . | . | . | . |
| AGRO THUR | . | . | . | . | T | . | . | . | . | . | . | . | . | . |
| BROM CARI | T | . | . | . | . | . | . | . | . | . | . | . | 1 | . |
| BROM CILI | . | . | . | . | 1 | . | . | . | . | . | T | . | . | . |
| CALA CANA | . | . | . | . | . | 1 | T | . | 6 | . | . | . | . | 7 |
| CALA INEX | . | T | . | . | . | . | . | . | . | . | . | . | . | . |
| CARX AQUA | 3 | . | . | 3 | . | T | . | . | 4 | . | . | . | . | 1 |
| CARX ATHR | . | . | . | . | . | . | . | . | . | . | . | . | T | . |
| CARX DOUG | . | . | . | . | . | . | . | . | . | . | . | . | T | . |
| CARX JONE | . | . | . | . | . | . | 1 | . | . | . | . | . | . | . |
| CARX LANU | 1 | T | . | . | . | . | . | . | T | . | . | . | . | . |
| CARX LEPO | . | . | . | . | . | . | . | . | . | T | . | . | . | . |
| CARX LUZU | . | . | . | . | . | 1 | . | . | . | . | . | . | . | . |
| CARX NEBR | 6 | 7 | T | . | . | . | . | . | . | . | . | . | . | . |
| CARX NEUR | . | . | . | . | . | . | . | . | . | . | . | . | . | 1 |
| CARX ROST | . | T | T | . | . | . | . | B | . | . | . | . | . | . |
| CARX SCOP | . | . | . | . | . | 5 | 6 | . | . | . | . | . | . | . |
| CARX SIMI | . | 3 | . | . | . | . | . | . | . | . | . | . | . | . |
| DESC CESP | T | . | . | . | . | . | . | . | . | 2 | . | . | . | . |
| ELYM GLAU | . | . | . | . | T | . | . | . | . | . | . | . | . | . |
| GLYC STRI | 4 | T | . | . | . | . | . | . | . | . | . | . | . | . |
| JUNC BALT | T | 1 | . | . | . | . | . | T | . | T | . | . | . | . |
| JUNC ENSI | . | . | T | 1 | . | . | . | . | . | . | . | . | . | . |
| JUNC LONG | T | T | . | . | . | . | . | . | . | . | . | . | . | . |
| LUZU CAMP | . | . | . | . | . | . | . | . | . | . | T | . | . | . |
| LUZU PARV | . | . | . | 2 | . | . | . | . | . | . | . | . | . | . |
| MELI SPEC | . | . | . | . | . | . | . | . | . | . | . | . | T | . |
| PHLE ALPI | . | . | . | . | T | T | . | . | . | . | . | . | . | . |
| PHLE PRAT | . | . | T | . | . | . | . | . | . | . | T | T | . | . |
| POA INTE | . | . | . | . | . | . | . | . | . | . | . | T | . | . |
| POA PALU | . | . | 1 | . | . | 3 | . | . | . | . | . | . | 2 | . |
| POA PRAT | T | T | 1 | . | . | . | . | . | . | . | . | . | . | . |
| ACHI MILL | . | . | T | T | T | T | . | T | . | 1 | . | . | 1 | . |
| ACON COLU | . | . | . | 1 | . | . | . | . | . | . | . | . | . | T |
| ACTA RUBR | . | . | . | . | . | . | . | . | . | . | T | 1 | . | . |
| AGOS GLAU | . | . | . | . | . | . | . | . | . | T | . | . | . | . |
| ANGE ARGU | . | . | . | 2 | . | . | . | . | . | . | . | . | . | . |
| ANTE CORY | . | . | . | . | . | . | . | . | . | 2 | . | . | . | . |
| ANTE ROSE | . | . | . | . | . | T | . | . | . | . | . | . | . | . |
| ARNI CHAM | . | . | . | . | . | . | . | 2 | T | . | . | . | . | . |
| ASTE EATO | . | . | 1 | . | . | . | . | . | . | . | . | . | . | . |
| ASTE FOLI | 2 | T | T | . | 2 | 6 | . | . | . | . | 1 | T | . | . |
| ASTE INTE | . | . | . | . | . | . | . | . | . | . | . | . | 2 | . |
| CALT BICO | . | . | . | . | . | T | T | . | . | . | . | . | . | . |
| CAST COVI | . | . | . | . | . | . | . | . | . | 1 | . | . | . | . |
| CAST MINI | T | T | . | 1 | . | . | . | . | . | . | . | T | 1 | . |
| DELF OCCI | . | . | . | . | T | . | . | . | . | . | . | . | 4 | . |
| DODE JEFF | . | . | . | . | . | . | T | . | T | . | . | . | . | . |
| EPIL ANGU | . | . | . | . | 1 | . | . | . | 1 | . | . | . | 2 | . |
| EPIL GLAN | . | T | T | 1 | . | . | T | 3 | . | . | . | . | . | . |
| EQUI ARVE | . | . | . | 4 | 3 | . | T | . | . | . | 1 | . | . | T |
| FRAG VIRG | 1 | T | . | . | 1 | . | . | . | 1 | T | T | T | 1 | . |
| GALI BORE | . | . | . | . | T | . | . | . | T | . | . | 1 | T | . |
| GALI TRFL | . | . | . | . | T | . | . | . | . | . | T | . | . | . |
| GENT AFFI | . | . | . | . | . | . | . | . | . | T | . | . | . | . |
| GERA RICH | . | . | . | . | 2 | . | . | . | T | . | 1 | 1 | 1 | . |
| GERA VISC | . | . | . | . | . | . | . | . | . | . | . | T | 3 | . |
| GEUM MACR | 1 | T | . | . | . | . | 1 | 1 | . | . | . | . | . | . |
| HABE HYPE | . | . | . | 1 | . | . | . | . | T | . | . | . | . | T |
| HERA LANA | . | . | . | . | . | . | . | . | . | . | . | T | . | . |
| LIGU CANB | . | . | . | . | . | . | . | . | . | . | . | . | . | T |
| LIGU FILI | . | . | . | . | 3 | . | . | . | . | . | . | . | 1 | . |
| LIGU TENU | . | . | . | . | . | 4 | T | . | 1 | 1 | . | . | . | . |
| LUPI POLY | . | . | . | 2 | T | T | . | . | . | 1 | T | 1 | 1 | T |
| MENT ARVE | . | . | . | . | . | . | . | . | . | . | . | T | . | . |
| MERT CILI | . | . | T | . | . | . | . | . | . | . | . | . | . | . |
| MIMU GUTT | . | 2 | . | 1 | . | . | . | . | . | . | . | . | . | . |
| MIMU PRIM | . | . | . | . | . | T | . | . | . | . | . | . | . | . |
| MONT CORD | . | . | . | . | . | . | 5 | . | . | . | . | . | . | . |
| OSMO CHIL | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| PARN FIBR | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| PEDI [illegible] | . | . | . | . | . | . | . | . | . | . | . | . | . | . |

Appendix H. Association Tables
Reproduced from Tuhy and Jensen, 1982.

| | | ST L4A | STL L5A | AS L3A | VL R1B | FR L3A | AJ II R1C | SL L3B | AY MDW -1C | BVR L3A | STL R6B | WS L6A | LC L2A | HL VT R2F | MR L3B | EL WET MDW -2A | AY MDW -2A | BVR L3B | BAN R3A | MA I R5A | HD I -7B | MA I R4E | FI I -2C | STL L5B | HO R3A |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 59 | 65 | 107 | 53 | 70 | 150 | 8 | 114 | 84 | 69 | 20 | 9 | 134 | 97 | 117 | 111 | 85 | 94 | 135 | 152 | 136 | 145 | 66 | 2 |
| TREES | | | | | | | | | | | | | | | | | | | | | | | | | |
| | PICE EN R | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | T | . | . |
| | PINU CO O | . | . | . | . | . | . | . | . | . | 5 | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| | PINU CO R | . | . | . | . | . | . | . | . | . | 1 | . | . | . | . | . | . | . | . | . | . | . | . | 1 | . |
| SHRUBS | | | | | | | | | | | | | | | | | | | | | | | | | |
| | ALNU INCA | . | . | . | . | . | . | . | . | . | . | T | . | . | . | . | . | . | . | . | . | . | . | . | . |
| | BETU GLAN | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 5 | . | . | . | . | . |
| | LONI CAER | . | . | . | . | . | . | . | . | 1 | T | . | . | . | . | 2 | 7 | 1 | 1 | . | . | T | . | . | . |
| | LONI INVO | . | . | . | . | . | . | . | . | . | . | 1 | . | . | . | . | . | . | . | . | . | . | . | . | . |
| | POTE FRUT | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | T | . | . |
| | RIBE LACU | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 1 | . | . |
| | RIBE HUDS | . | . | . | . | . | . | . | . | . | . | 1 | . | . | . | . | . | . | . | . | . | . | 1 | . | . |
| | SALX DRUM | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 5 | 5 | 7 | . | . | . | . |
| | SALX GEYR | . | . | . | . | . | . | T | . | . | 1 | . | . | . | . | . | . | . | . | . | . | 6 | 3 | 4 | 4 |
| | SALX MYRT | . | . | . | . | . | . | T | . | . | . | . | . | . | . | . | . | . | 5 | 1 | . | . | 5 | . | 1 |
| | SALX PHYL | . | T | 1 | . | . | . | . | 1 | T | T | . | . | T | 7 | 7 | 2 | . | 1 | . | . | . | . | 3 | . |
| | SALX WOID | T | T | . | . | . | . | . | . | 1 | T | . | . | . | 1 | . | 5 | 5 | 4 | . | . | . | . | 2 | . |
| | VACC OCCI | . | T | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| GRAMINOIDS | | | | | | | | | | | | | | | | | | | | | | | | | |
| | AGRP CANI | . | . | . | . | . | . | . | . | . | . | . | T | . | . | . | . | . | . | . | . | . | . | . | . |
| | AGRS EXAR | . | . | . | . | . | . | . | . | . | T | . | T | . | . | . | . | . | . | . | . | . | . | . | . |
| | AGRS SCAB | . | . | . | . | . | . | . | T | . | T | . | . | . | . | . | . | . | . | . | T | . | . | . | . |
| | BROM CILI | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | T | 1 | . | . | . | . | . | . | . |
| | CALA CANA | . | . | . | 1 | . | . | . | . | 2 | 5 | 2 | . | 1 | . | . | 1 | 4 | 5 | 4 | 2 | 4 | 1 | 1 | . |
| | CARX AQUA | 6 | 6 | 4 | 5 | 4 | 1 | . | 3 | 7 | 5 | 4 | . | 2 | 3 | T | . | 6 | 4 | 4 | 5 | 5 | 5 | 5 | 2 |
| | CARX BUXB | . | . | . | . | . | . | . | . | . | . | . | . | 4 | . | . | . | . | . | . | . | . | . | . | . |
| | CARX CANE | . | . | 1 | . | . | . | . | . | . | 4 | . | . | . | . | . | . | . | . | . | . | 1 | . | . | . |
| | CARX CUSI | . | . | 1 | . | . | 1 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 4 | . | . |
| | CARX DISP | . | . | . | . | . | . | . | . | . | . | T | . | . | . | . | . | . | . | 1 | . | 1 | . | . | . |
| | CARX JONE | . | . | . | . | . | . | . | . | . | . | . | . | . | T | . | . | . | . | . | . | . | . | . | . |
| | CARX LIVI | . | . | . | . | . | . | . | . | . | . | . | . | 1 | . | . | . | . | . | . | . | . | . | . | . |
| | CARX MICR | . | T | . | . | T | . | . | . | . | T | . | T | . | . | . | . | . | . | . | . | . | . | . | T |
| | CARX MURI | . | . | 4 | . | . | . | . | . | . | T | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| | CARX ROST | 6 | 6 | 7 | 7 | 6 | 6 | 8 | 5 | . | 1 | 5 | 2 | . | 6 | 5 | 6 | 4 | 5 | 4 | 5 | 4 | 5 | . | 7 |
| | CARX SAXA | . | . | . | . | . | . | . | . | . | . | . | . | 4 | . | . | . | . | . | . | . | . | . | . | . |
| | CARX SCOP | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 2 | 3 | . | . | . | . | . |
| | CARX SIMU | . | . | . | . | . | . | . | 6 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| | DESC CESP | . | T | T | . | . | . | . | . | . | . | . | . | 1 | . | . | . | . | . | . | . | . | . | 2 | . |
| | ELEO PAUC | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | T |
| | GLYC STRI | . | . | . | . | . | . | . | . | . | . | 3 | . | . | . | . | . | . | . | . | . | . | . | . | . |
| | HORD BRAC | . | . | . | 4 | 1 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| | JUNC BA/L | . | . | . | . | T | 1 | . | . | . | . | . | 1 | . | . | . | 1 | . | . | . | . | . | T | . | T |
| | LUZU CAMP | . | . | . | . | . | . | . | . | . | T | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| | MUHL FILI | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 1 | 1 |
| | PHLE ALPI | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | T | . |
| | POA PALU | . | . | . | 1 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | T | . | . |
| | POA PRAT | . | . | . | T | T | T | . | . | T | T | . | 1 | . | . | . | . | 1 | . | . | . | . | T | . | . |
| FORBS | | | | | | | | | | | | | | | | | | | | | | | | | |
| | ACHI MILL | . | . | . | . | T | T | . | . | . | . | . | . | . | . | . | . | T | . | . | . | . | . | . | . |
| | ACON COLU | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | T | . | T | . | . | . | . | . | . |
| | ARNI CHAM | . | . | . | 1 | 1 | . | . | . | 1 | . | . | . | . | . | . | . | 1 | . | . | . | . | . | . | . |
| | ASTE FOLI | . | T | . | T | . | . | . | . | . | 1 | . | . | T | T | . | 1 | 1 | 1 | . | . | . | . | T | . |
| | CALT LEPT | . | . | . | . | . | . | . | . | . | . | . | . | . | T | . | . | . | . | . | . | . | . | . | . |
| | CAST MINI | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | T | . | . | . |
| | DODE JEFF | . | . | . | . | . | . | . | 1 | . | 1 | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| | EFIL ANGU | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | T | . | . |
| | EPIL GLAN | 1 | . | . | 1 | 1 | T | . | T | . | 1 | 1 | 4 | . | . | . | . | . | . | . | 1 | . | 1 | . | . |
| | EQUI ARVE | . | . | . | . | . | . | 2 | . | . | . | 5 | 4 | . | . | . | . | . | . | . | 1 | . | 1 | . | . |
| | FRAG VIRG | . | . | . | . | . | . | . | . | . | 1 | . | . | . | . | . | T | . | . | . | . | T | . | . | . |
| | GALI TRFI | T | T | . | 1 | 1 | 1 | . | T | 1 | 1 | 1 | . | . | . | 1 | 1 | 1 | T | T | . | . | T | . | T |
| | GEUM MACR | . | . | . | 1 | 1 | T | . | . | . | T | . | . | . | . | . | 1 | T | . | . | . | . | . | . | . |
| | MIMU GUTT | . | . | . | . | . | . | . | . | . | . | . | 5 | . | . | . | . | . | . | . | . | . | . | . | . |
| | PEDI GROE | . | . | 1 | . | . | . | . | 1 | . | . | . | . | T | T | . | . | . | . | . | . | . | . | . | . |
| | PENS GLOB | . | . | . | . | . | . | . | . | . | . | . | . | . | T | 4 | . | . | . | . | . | . | . | . | . |
| | POLE OCCI | . | . | . | . | 2 | 1 | . | . | T | . | . | 1 | . | . | . | 1 | 2 | 1 | . | T | . | . | . | T |
| | POTE GRAC | . | . | . | . | . | . | . | . | . | T | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| | SAXI ARGU | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | T | . | . | . | . |
| | SAXI OREG | . | . | . | . | . | . | . | . | . | T | . | . | . | T | . | . | T | . | . | . | . | . | . | . |
| | SENE CYMB | . | . | . | . | . | . | . | . | . | . | . | . | T | . | . | . | . | . | . | . | . | . | . | . |
| | SENE PSEU | . | . | . | . | . | . | . | . | . | 1 | . | . | . | . | . | . | T | . | . | . | . | . | . | . |
| | SMIL STEL | . | . | . | . | . | . | . | . | . | . | T | . | . | . | . | . | . | . | . | . | . | T | . | . |
| | STEL LONG | . | . | . | T | T | T | . | . | . | . | . | . | . | . | . | . | . | T | . | . | . | . | . | . |
| | TARX OFFI | . | . | . | . | T | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| | THAL OCCI | . | . | . | . | . | . | . | . | . | . | T | . | . | . | . | . | T | . | . | . | . | . | . | . |
| | TRIF LONG | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 1 | . |
| | VERO AMER | . | . | . | . | . | . | . | . | . | . | . | 1 | . | . | . | . | . | . | . | . | . | T | . | . |
| | VIOL NEPH | . | . | . | . | . | T | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 1 |

SCCE-CALI

SCCE-CALI

CARX SCOP?

| | ELPA | | | | | | | | | JUBA | | | | | DECE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | HL VT R4A | MA I L3C | ST L2B | BS -1A | HU -1A | CPH SUM -1B | EL WET MDW -2B | MCK SO | STL L3A | ST R2A | AY MDW -1A | 4J II R1B | PCM B | MR R1A | DVR R2B | DVR R4D | BEN L1A | BS -1C | AY MDW -1B | HU -1B | VL R3A | DVR R4C | VAN SUM |
| | 132 | 138 | 64 | 100 | 73 | 90 | 118 | 37 | 50 | 62 | 112 | 151 | 160 | 104 | 88 | 83 | 92 | 101 | 113 | 74 | 55 | 82 | 79 |
| TREES | | | | | | | | | | | | | | | | | | | | | | | |
| PICE EN R | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | T |
| PINU CO R | T | T | . | . | . | . | . | . | T | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| SHRUBS | | | | | | | | | | | | | | | | | | | | | | | |
| BETU GLAN | . | . | . | . | . | . | . | . | 1 | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| LONI CAER | T | T | . | . | T | . | . | . | 1 | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| POTE FRUT | T | T | . | . | T | . | . | . | T | . | . | 1 | . | . | . | . | . | . | . | 1 | . | . | . |
| SALX COMM | . | . | . | . | . | . | . | 1 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| SALX PHYL | . | . | . | . | . | . | T | 1 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| SALX WOID | . | . | . | . | . | . | . | . | T | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| VACC OCCI | T | . | . | . | T | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| GRAMINOIDS | | | | | | | | | | | | | | | | | | | | | | | |
| AGRP CANI | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 1 | . |
| AGRS IDAH | . | . | . | . | . | 1 | T | . | . | . | . | . | . | 1 | 1 | 2 | 1 | . | . | . | . | T | . |
| CARX AQUA | 1 | . | . | . | . | 1 | T | . | T | . | . | . | 1 | 1 | . | 1 | 1 | . | T | . | . | T | . |
| CARX ATHR | . | . | . | . | . | . | . | . | . | 6 | . | . | . | . | . | . | . | . | . | . | . | . | . |
| CARX BUXB | . | . | . | . | . | . | . | . | 4 | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| CARX CANE | . | . | . | . | . | . | . | 1 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| CARX CUSI | . | . | 1 | . | . | . | . | . | 1 | . | . | 1 | . | . | . | . | . | . | . | . | . | . | . |
| CARX DIOI | . | . | . | . | . | . | . | . | T | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| CARX JONE | . | . | . | . | . | T | . | . | . | . | . | . | . | 1 | T | 3 | . | . | . | . | T | . | . |
| CARX LANU | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 5 | . | 1 | . | . | . | . | . | . |
| CARX LIVI | 1 | 4 | . | 4 | . | . | . | . | T | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| CARX LUZU | . | . | . | . | . | T | . | . | . | . | . | . | . | . | . | 4 | . | . | . | . | . | T | . |
| CARX MICR | . | . | . | . | . | . | . | . | . | 2 | . | . | . | 1 | T | 1 | T | 1 | 1 | . | T | 1 | . |
| CARX MURI | T | 1 | . | T | 4 | . | T | . | T | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| CARX PRAE | . | . | . | . | . | . | . | . | . | . | . | . | 1 | . | . | . | . | . | . | . | T | . | . |
| CARX ROST | . | . | 1 | 1 | 2 | . | 3 | . | 1 | . | . | . | . | 1 | T | . | . | . | . | . | . | . | . |
| CARX SCOP | . | . | . | . | . | . | . | 5 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| CARX SIMU | . | . | 5 | . | 2 | T | . | . | . | 5 | 4 | . | . | 1 | . | . | . | . | . | . | . | . | . |
| DANT INTE | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 1 | . | . | . | T | . |
| DESC CESP | . | T | . | T | . | T | 3 | . | 1 | 5 | 5 | 1 | 1 | 4 | 5 | 3 | 5 | 5 | 5 | 5 | 3 | 4 | 2 |
| ELEO PAUC | 2 | 3 | 5 | 7 | 4 | 6 | 5 | 2 | 4 | . | . | . | . | 1 | 4 | 4 | 5 | . | . | . | . | . | . |
| HORD PRAC | . | . | . | . | . | . | . | . | . | 1 | . | T | 1 | T | . | . | . | . | . | . | . | T | . |
| JUNC BAIL | . | T | 1 | . | . | . | . | . | 1 | 5 | 6 | 5 | 6 | 6 | 1 | . | . | T | T | . | . | T | . |
| NOEL CRIS | . | . | . | . | . | . | . | . | . | T | . | . | . | . | . | . | . | . | . | . | . | T | . |
| LUZU CAMP | . | . | . | . | . | . | . | . | . | . | . | . | . | 1 | . | 2 | . | T | . | . | T | 2 | 1 |
| MUHL FILI | . | . | . | . | T | 1 | . | . | 1 | 1 | . | 5 | 2 | 2 | 6 | 2 | 1 | . | . | . | 1 | 1 | . |
| PHLE ALPI | . | . | . | . | . | . | . | . | . | . | . | . | T | 2 | 1 | 1 | 1 | 1 | . | . | 1 | 2 | 1 |
| POA FRAT | . | . | . | . | . | . | . | . | . | . | . | T | 1 | 1 | . | . | T | T | . | . | 1 | 1 | . |
| SCIR CESP | 5 | 4 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| STIP OCHI | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | T | . |
| TRIS WOLF | . | . | . | . | . | . | . | . | . | . | . | . | . | 3 | . | 1 | . | . | . | . | . | 1 | . |
| FORBS | | | | | | | | | | | | | | | | | | | | | | | |
| ACHI MILL | . | . | . | . | . | . | . | . | . | . | . | T | 1 | T | . | T | . | 1 | . | . | 2 | 4 | . |
| AGOS GLAU | . | . | . | . | . | . | . | . | . | . | . | . | . | . | T | . | . | 3 | 1 | T | . | . | . |
| ANTE CORY | . | . | . | . | . | . | . | . | . | . | . | . | . | 1 | T | 1 | 1 | 4 | 1 | 3 | . | . | 1 |
| ARNI CHAM | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 1 | . | . | . | . | T | 1 | . |
| ASTE FOLI | T | . | . | . | . | T | . | . | . | 5 | T | 1 | 1 | 1 | 2 | 1 | 1 | 1 | . | . | T | 3 | T |
| ASTE OCCI | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 2 | . | . | . | . |
| CALT LEPT | . | . | 1 | 1 | . | . | . | 1 | T | . | . | . | . | . | T | . | T | . | . | . | . | . | . |
| CAST CUSI | . | . | . | . | . | . | . | . | . | . | . | . | . | T | . | . | 1 | T | 2 | . | . | 3 | . |
| CIRS IUM | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | T | . | . | . | . | . |
| DODE JEFF | . | . | . | . | . | . | . | . | . | . | 2 | . | . | 2 | 5 | 1 | . | . | . | . | . | . | 1 |
| DROS ANGL | 1 | 2 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| EPIL GLAN | . | . | . | . | . | . | . | . | . | T | T | T | . | T | T | . | . | . | . | T | . | T | . |
| EQUI ARVE | . | T | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| ERIG FERE | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 6 |
| FRAG VIRG | . | . | . | . | . | . | . | . | . | . | . | . | . | T | . | . | . | . | . | . | . | . | . |
| GALI TRFI | . | . | . | . | . | . | . | . | . | . | . | 1 | . | 1 | . | . | . | . | . | . | . | . | . |
| GENT AFFI | . | . | . | . | . | . | . | . | . | . | 2 | . | . | T | . | . | . | 1 | 2 | . | . | . | T |
| GEUM MACR | . | . | . | . | . | . | . | . | . | . | . | 1 | T | 1 | T | T | T | . | . | . | T | T | . |
| LIGU TENU | T | . | . | . | . | . | . | . | T | . | . | . | . | . | . | . | T | . | . | . | . | T | . |
| MIMU PRIM | . | . | T | . | . | 2 | 1 | . | . | . | . | . | . | T | 1 | 1 | . | . | . | . | . | . | . |
| PEDI GROE | 1 | T | T | 1 | 1 | 1 | 1 | 1 | 1 | . | . | . | . | 2 | 2 | 1 | T | . | . | T | . | . | 2 |
| PENS GLOB | . | . | . | . | . | . | . | . | . | 1 | 3 | . | . | 1 | . | . | T | . | 1 | 1 | . | . | . |
| POLE OCCI | . | . | . | . | . | . | . | . | . | . | . | . | T | . | . | . | . | . | . | . | . | . | . |
| POLY BIST | . | . | . | . | . | . | 3 | . | . | T | . | . | . | T | 2 | . | 1 | T | T | . | . | . | 1 |
| POLY DOUG | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | T | . | . | . | . |
| POTE DIVE | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 4 | . | T | . | . | T | T |
| POTE GRAC | . | . | . | . | . | . | . | . | . | 1 | . | T | T | . | . | T | 1 | . | . | . | . | 1 | 1 |
| RANU ACRI | . | . | . | . | . | . | . | . | . | T | . | . | 1 | . | . | . | . | . | . | . | T | . | . |
| RANU ALIS | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 1 | T | 1 | T | 1 | . | . | T | 1 |
| SAXI OREG | . | . | T | . | . | . | T | T | . | . | . | . | . | 2 | . | 1 | . | . | . | . | . | T | . |
| SENE CYMB | 1 | . | . | . | . | T | 2 | 1 | 1 | . | . | . | . | . | . | T | . | . | . | . | . | . | . |
| SENE INTE | . | . | . | . | . | . | . | . | . | T | 1 | . | . | T | . | . | 1 | . | 3 | . | . | 3 | . |
| STEL LONG | . | . | . | . | . | . | . | . | . | . | . | T | . | 1 | . | T | 1 | . | . | . | 1 | 1 | T |
| SWER PERE | 1 | T | T | T | . | . | . | . | T | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| TARX OFFI | . | . | . | . | . | . | . | . | . | . | . | . | 2 | T | . | T | 1 | . | . | . | 2 | 2 | . |
| TRIF LONG | . | . | . | . | . | . | . | . | . | 1 | . | . | 1 | 1 | 1 | 1 | . | 1 | 1 | . | 1 | 4 | . |
| VERO WORM | . | . | . | . | . | . | . | T | . | . | . | . | . | . | . | T | . | . | . | . | . | . | 1 |
| VIOL NEPH | . | . | . | . | . | . | . | . | . | . | . | 1 | 1 | . | . | . | . | . | . | . | . | . | . |

| | POPR | | | | | | | | ASIN-FEID | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | FR L3C | HD I R7D | 4J III L1E | MR CAN R2A | FI I L3B | WS L4B | LC L2B | BA R4E | MCK R1A | VL R1C | FR L3B | BVR R4A | AY MDW -1E | EL L2A |
| | 72 | 153 | 148 | 172 | 144 | 16 | 10 | 31 | 39 | 54 | 71 | 80 | 116 | 122 |
| TREES | | | | | | | | | | | | | | |
| SHRUBS | | | | | | | | | | | | | | |
| POTE FRUT | 1 | . | . | . | . | . | . | . | . | . | . | . | . | . |
| SALX GEYR | . | . | . | . | . | . | T | . | . | . | . | . | . | . |
| SALX MYRT | . | . | . | . | . | . | 1 | . | . | . | . | . | . | . |
| SALX WOID | T | . | . | . | . | . | . | . | . | . | . | . | . | . |
| GRAMINOIDS | | | | | | | | | | | | | | |
| AGRP CANI | T | T | T | 2 | . | 1 | . | . | . | 1 | 1 | 1 | 5 | 1 |
| AGRS SCAB | T | . | . | T | . | . | . | 4 | . | . | . | 1 | 1 | . |
| ALOP AEQU | . | . | . | . | . | . | . | 1 | . | . | . | . | . | . |
| BROM CARI | . | . | . | . | . | . | . | . | . | . | T | 1 | T | . |
| BROM CILI | . | . | 1 | 1 | . | 1 | 1 | . | . | . | . | . | . | . |
| CARX AQUA | 1 | 1 | . | 2 | 5 | . | . | . | . | . | . | . | . | . |
| CARX ATHR | . | . | . | . | . | . | . | . | 4 | . | . | . | . | . |
| CARX MICR | 1 | 3 | . | 1 | . | T | 5 | 6 | 1 | T | T | . | 5 | 5 |
| CARX PRAE | . | . | . | . | . | . | . | . | . | 1 | . | . | . | . |
| CARX PRAT | . | . | . | . | . | 2 | . | . | . | 1 | . | . | . | 1 |
| CARX ROST | . | . | 1 | . | . | . | . | . | . | . | . | . | . | . |
| DANT INTE | . | . | . | . | . | . | . | . | . | 1 | . | . | . | . |
| DESC CESP | . | T | . | . | . | . | . | . | T | T | . | . | . | . |
| FEST IDAH | . | . | . | . | . | . | . | . | . | 4 | 1 | . | . | . |
| HORD BRAC | 1 | 2 | . | 1 | 1 | . | . | . | . | . | 1 | 1 | . | . |
| JUNC BA/L | 5 | 1 | . | . | 1 | 5 | 4 | . | . | 1 | . | . | . | T |
| KOEL CRIS | . | . | . | . | . | . | . | . | . | 1 | T | . | 4 | . |
| LUZU CAMP | 1 | 1 | . | . | . | . | . | . | . | . | . | . | 3 | . |
| MELI SPEC | . | . | . | T | . | . | . | . | . | . | 1 | . | 2 | . |
| MUHL FILI | . | . | . | . | . | . | . | 4 | . | . | . | . | . | . |
| PHLE ALPI | T | 1 | . | 1 | . | . | . | . | . | . | . | T | 2 | . |
| POA NEVA | . | . | . | . | . | . | . | . | . | . | 2 | . | 1 | 5 |
| POA PALU | . | . | . | . | . | . | . | 1 | . | . | . | . | . | . |
| POA PRAT | 4 | 2 | 5 | 4 | 5 | 7 | 5 | 3 | 1 | 5 | . | . | . | . |
| STIP OCMI | . | . | . | . | . | T | . | . | 2 | 1 | T | T | T | . |
| TRIS WOLF | T | . | 1 | 1 | 2 | . | . | . | . | . | . | . | . | . |
| FORBS | | | | | | | | | | | | | | |
| ACHI MILL | 2 | 1 | 1 | 1 | 1 | 1 | . | . | T | 1 | 1 | 1 | 2 | 1 |
| AGOS GLAU | T | . | T | . | . | . | . | . | . | 1 | T | . | . | . |
| ANTE CORY | 2 | . | . | . | . | . | . | 2 | 5 | . | . | . | . | . |
| ANTE MICR | . | . | . | . | . | T | . | T | . | 2 | T | . | . | . |
| ARNI CHAM | T | T | . | 1 | 2 | 4 | . | . | . | . | . | . | . | . |
| ASTE FOLI | 1 | 1 | 2 | 2 | 1 | 1 | 1 | . | . | . | . | 1 | . | 1 |
| ASTE INTG | . | . | . | . | . | . | . | . | . | 1 | 4 | 1 | . | . |
| CAST CUSI | . | 1 | . | . | . | . | . | . | . | T | . | . | . | T |
| CAST MINI | . | . | . | . | . | . | 1 | . | . | . | . | . | . | . |
| CIRS IUM | . | T | T | . | . | . | . | . | T | 1 | T | T | . | . |
| EPIL GLAN | T | . | T | . | 1 | . | T | T | . | . | . | T | . | . |
| EQUI ARVE | . | . | . | . | . | . | T | . | . | . | . | . | . | . |
| FRAG VIRG | 1 | T | 2 | 2 | . | 1 | . | . | 1 | 5 | 2 | . | 4 | . |
| GALI TRFI | . | . | . | . | . | . | T | 1 | . | . | . | . | . | . |
| GENT AFFI | . | . | . | . | . | 1 | . | . | . | . | . | . | . | . |
| GEUM MACR | 1 | 1 | 1 | . | T | . | T | T | . | . | . | T | . | . |
| GEUM TRIF | . | . | . | . | . | . | . | . | 1 | 2 | T | . | T | . |
| LINA HARK | . | . | . | . | . | . | . | . | . | . | T | 1 | 1 | . |
| MIMU PRIM | . | . | . | . | . | . | . | . | . | . | . | T | . | . |
| PENS GLOB | . | . | . | 1 | . | . | . | 1 | 6 | . | . | T | . | . |
| POLE OCCI | T | . | 1 | T | . | . | . | . | . | . | . | . | . | . |
| POLY BIST | . | . | . | . | . | . | . | . | . | . | . | . | . | 1 |
| POLY DOUG | . | . | . | . | . | . | . | . | T | T | T | 1 | T | . |
| POTE GRAC | T | 1 | 1 | 1 | . | 4 | . | . | . | 1 | 1 | . | . | . |
| RANU ACRI | 1 | 1 | 1 | . | . | . | . | . | . | . | . | . | . | . |
| RANU ALIS | . | . | . | . | . | . | . | . | . | . | . | . | . | T |
| SAGI NA | . | T | . | . | . | . | . | . | . | . | . | T | . | . |
| SENE INTE | . | . | . | . | . | . | . | . | . | . | . | 2 | 2 | 5 |
| SENE PSEU | 1 | . | T | . | . | T | . | . | . | . | . | . | . | . |
| SENE SPHA | T | T | 1 | . | 4 | . | . | . | . | . | 2 | . | . | . |
| SOLI CANA | . | . | . | . | . | . | . | . | . | T | . | . | . | . |
| STEL LONG | 1 | T | 1 | 1 | T | 1 | 1 | T | T | . | T | T | T | . |
| TARX OFFI | 1 | 1 | 1 | . | . | T | 2 | T | . | T | 2 | T | T | . |
| TRIF LONG | 4 | 1 | 1 | . | 1 | . | . | T | 2 | 3 | 1 | 1 | 1 | 5 |
| VALE EDUL | . | . | . | . | . | . | . | . | . | . | . | T | . | . |

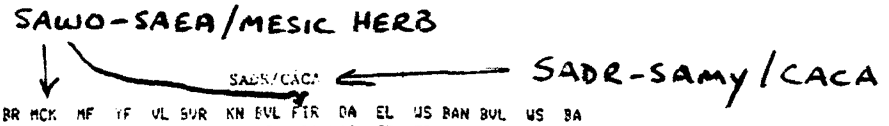
DRY MEAD.

DRY MEAD.

DRY MEAD.

SAWO-SAEA/MESIC HERB

| | SAWO/SWPE | | | | | | | | | | | | | | | SAWO/CAMI | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | BA R4A | 4J II L5A | HD I R7E | US MDW L1A | FK III L1B | MCK R1B | BEN L1B | MR L3D | FA L1A | RVR R2A | ST L2A | PO II L3C | PCM A | DA L1A | KN R3B | AY MDW -1D | BUL R2A | MR L3A | MCK R1C |
| | 27 | 149 | 155 | 164 | 141 | 40 | 93 | 99 | 57 | 87 | 63 | 163 | 159 | 109 | 106 | 115 | 125 | 96 | 42 |
| TREES | | | | | | | | | | | | | | | | | | | |
| PINU CO O | . | . | . | . | 2 | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| SHRUBS | | | | | | | | | | | | | | | | | | | |
| BETU GLAN | . | . | . | . | 5 | . | . | . | T | . | . | 3 | . | . | . | . | . | . | . |
| LONI CAER | 4 | 3 | . | T | 3 | 3 | 1 | 1 | 1 | 2 | 3 | 4 | . | 5 | . | . | 4 | . | 5 |
| POTE FRUT | 2 | 1 | . | . | 4 | . | . | . | T | 1 | 5 | 3 | . | . | . | . | . | . | . |
| SALX MYRT | . | . | . | . | 1 | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| SALX PHYL | . | . | . | . | . | . | 2 | 1 | 1 | 1 | . | . | . | . | 3 | . | . | . | . |
| SALX WOID | 7 | 6 | 5 | 6 | 5 | 5 | 6 | 6 | 5 | 5 | 4 | 3 | . | 7 | 4 | 7 | 6 | 6 | 7 |
| VACC CAES | . | . | . | . | T | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| GRAMINOIDS | | | | | | | | | | | | | | | | | | | |
| AGRP CANI | . | . | . | . | . | . | . | . | . | . | . | . | . | T | 1 | . | . | T | . |
| AGRS EXAR | . | . | T | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| AGRS IDAH | . | . | . | . | . | . | 5 | 1 | . | 1 | . | . | . | . | . | . | . | . | . |
| AGRS SCAB | T | . | T | . | . | . | . | . | . | 1 | T | . | . | . | . | T | . | . | . |
| BROM CILI | 1 | T | . | . | 1 | . | . | . | . | . | . | . | . | 2 | 1 | . | . | . | . |
| CALA CANA | 1 | . | . | . | 5 | . | . | . | . | T | . | . | . | 4 | 1 | . | . | . | 2 |
| CARX AQUA | 2 | 1 | 1 | 3 | 2 | . | 2 | . | 2 | 3 | . | 1 | . | 3 | . | . | . | . | . |
| CARX ATHR | T | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| CARX CUSI | 4 | 2 | 1 | . | . | . | . | . | . | 5 | 1 | . | . | . | . | . | . | . | . |
| CARX DIGI | . | 2 | . | . | . | . | . | . | . | . | . | 2 | . | . | . | . | . | . | . |
| CARX JONE | . | . | . | . | . | . | T | T | T | 2 | . | . | . | . | T | T | . | . | . |
| CARX LUZU | . | . | . | . | . | . | 1 | 1 | . | 2 | . | . | . | . | . | . | . | . | . |
| CARX MICR | . | . | . | . | . | T | . | . | . | . | . | . | . | . | . | . | 1 | . | 3 |
| CARX MURI | . | . | . | . | . | . | . | . | 1 | T | T | . | . | . | . | . | . | . | . |
| CARX ROST | 1 | . | 2 | . | . | T | . | . | . | . | 1 | 1 | 1 | . | T | 1 | . | . | . |
| CARX SCOP | . | . | . | . | . | 5 | . | . | . | . | . | . | . | . | . | . | . | . | . |
| DANT INTE | . | . | . | . | . | . | . | . | T | . | . | . | . | . | . | . | T | . | . |
| DESC CESP | . | 2 | . | 1 | . | . | 2 | 2 | 1 | 1 | 1 | . | 1 | . | T | 2 | 2 | . | . |
| ELEO PAUC | . | . | . | . | . | . | 4 | . | . | 1 | . | 1 | 1 | . | . | . | . | . | . |
| HORD BRAC | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 1 | . | . | . |
| JUNC BAYL | 2 | 1 | 2 | . | 1 | . | . | . | 2 | T | 1 | 1 | 1 | . | . | 1 | 1 | T | . |
| LUZU CAMP | . | . | T | . | . | . | . | 1 | T | 2 | . | . | . | . | . | . | . | . | . |
| LUZU PARV | . | . | . | . | . | T | . | . | . | . | . | . | . | . | . | . | . | . | . |
| MUHL FILI | 1 | 1 | . | . | . | . | . | . | 1 | 1 | 1 | . | 2 | . | . | . | . | . | . |
| PHLE ALPI | T | T | . | T | . | . | 1 | . | 1 | 2 | . | . | . | . | . | T | T | . | . |
| POA NEVA | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 2 | . | . |
| POA PALU | . | . | . | . | . | 1 | . | . | . | . | . | . | . | . | . | . | . | . | 1 |
| POA PRAT | 1 | T | . | T | . | . | . | . | . | 1 | . | . | 1 | . | . | . | . | T | 1 |
| TRIS WOLF | . | . | . | . | . | . | T | . | . | 1 | . | . | . | . | T | . | 2 | T | . |
| FORBS | | | | | | | | | | | | | | | | | | | |
| ACHI MILL | . | T | T | T | 1 | . | . | . | 1 | T | . | . | T | T | . | . | 1 | 2 | 2 |
| ACON COLU | . | . | . | . | . | . | 1 | 3 | T | 1 | . | . | . | 1 | 2 | . | . | T | . |
| AGOS GLAU | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 2 | . |
| ANTE CORY | 1 | . | T | . | . | T | 2 | . | 1 | 1 | . | . | . | . | . | T | 1 | . | 1 |
| ARNI CHAM | T | . | . | 1 | T | . | . | . | . | . | . | . | . | . | 1 | . | . | . | . |
| ASTE FOLI | 4 | 1 | 1 | 2 | 2 | 2 | 2 | 1 | 1 | 2 | . | T | 1 | 2 | 3 | 3 | 4 | 2 | 4 |
| ASTE MODE | . | . | . | . | . | . | . | . | . | . | . | . | . | 2 | . | . | . | . | . |
| CALT LEPT | . | . | . | . | . | . | 1 | 5 | . | 4 | 5 | . | . | . | . | . | . | . | . |
| CAST CUSI | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | T | T | . |
| CIRS IUM | . | . | . | T | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| DODE JEFF | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 1 | T | . | . |
| EPIL GLAN | . | . | . | . | . | T | . | . | . | . | . | . | . | . | . | T | . | T | . |
| EQUI ARVE | . | . | . | . | . | . | . | . | . | T | . | . | . | . | . | . | . | . | . |
| FRAG VIRG | 3 | 2 | 1 | 3 | 1 | 2 | . | 1 | 3 | . | 1 | 1 | . | 2 | 4 | . | . | . | 4 |
| GALI TRFI | . | . | . | . | T | T | . | . | . | . | . | . | . | 1 | . | 1 | . | . | . |
| GENT AFFI | . | . | . | . | . | . | . | . | T | . | . | . | . | . | . | . | 2 | . | . |
| GEUM MACR | T | T | . | . | T | T | . | . | . | . | . | . | . | T | T | . | . | . | 1 |
| LIGU TENU | . | 2 | . | . | 1 | . | 3 | 2 | 2 | 1 | 2 | . | . | T | 1 | . | 1 | 1 | . |
| MIMU PRIM | . | . | . | . | . | T | 1 | . | 1 | 1 | 1 | . | . | . | . | . | . | . | . |
| PEDI GROE | 1 | 1 | 2 | . | . | T | 1 | T | 2 | 4 | 1 | . | 1 | . | T | 1 | T | . | . |
| PENS GLOB | T | . | . | . | . | . | . | . | . | . | . | . | . | . | T | T | 2 | . | T |
| POLE OCCI | 2 | 2 | 2 | 1 | 1 | . | . | T | . | 1 | . | . | . | 1 | . | . | . | T | . |
| POLY BIST | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | T | . | . |
| POLY DOUG | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | T | . |
| POTE DIVE | . | . | . | . | . | . | 1 | . | . | . | . | . | . | . | 1 | . | 2 | T | . |
| POTE GRAC | . | T | T | . | . | . | T | . | . | . | . | . | . | . | T | . | 1 | . | . |
| RANU ACRI | . | . | T | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| RANU ALIS | . | . | . | . | . | . | . | . | . | T | . | . | . | . | . | . | . | . | . |
| SAXI ODES | . | . | . | . | . | T | . | T | T | 1 | T | . | . | . | . | T | . | . | . |
| SELA SELA | . | T | . | . | . | . | . | . | . | T | . | T | 1 | . | . | . | . | . | . |
| SENE CYMB | . | . | . | . | . | 1 | 4 | 1 | . | 1 | . | . | . | . | . | . | . | . | . |
| SENE INTE | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | T | T | . |
| SENE PSEU | 1 | 1 | 1 | T | 1 | 2 | . | . | T | . | . | . | . | 1 | 4 | . | . | 1 | 1 |
| STEL LONG | T | 1 | . | 1 | . | T | T | T | T | T | . | . | . | T | T | . | T | 1 | T |
| SWER PERE | 4 | 3 | 2 | 2 | 3 | 1 | 1 | 1 | 2 | 2 | 2 | 1 | T | 1 | . | . | . | . | . |
| TARA OFFI | . | T | 1 | T | . | T | . | . | . | T | . | . | 1 | . | T | . | . | 1 | 1 |
| THAL ALPI | . | . | . | . | . | . | . | . | . | . | . | 2 | 2 | . | . | . | . | . | . |
| THAL OCCI | . | . | . | . | . | . | . | . | . | . | . | . | . | . | T | . | . | . | . |
| TRIF LONG | . | T | 1 | . | . | 1 | . | 1 | 1 | 1 | . | T | 1 | T | 1 | 1 | 1 | T | 1 |
| VALE EDUL | . | . | . | . | . | . | . | . | . | . | 1 | . | . | . | . | . | . | . | . |
| VERO AMER | . | . | . | . | . | . | . | . | . | T | . | . | . | . | . | . | . | . | . |
| VERO WORM | . | . | . | . | . | . | T | T | . | . | . | . | . | . | . | . | . | . | . |




| | BVL L3A | BR L2A | MCK R2A | MF R4A | YF R5A | VL L3A | SVR L3C | KN R3A | BVL -EL | FIR TRB JCT L1A | DA L1B | EL WET MDW -1A | WS L5B | BAN R2A | BVL L1A | WS L6B | BA L1C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 124 | 77 | 38 | 174 | 43 | 56 | 86 | 105 | 129 | 131 | 110 | 120 | 18 | 95 | 127 | 21 | 25 |
| TREES | | | | | | | | | | | | | | | | | |
| ABIE LA O | . | . | . | . | . | . | . | . | . | 1 | . | . | . | . | . | . | . |
| PICE EN R | . | 1 | . | . | 1 | . | . | . | . | . | . | . | . | . | . | . | . |
| PINU CO O | . | 1 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| PINU CO R | . | . | T | . | 1 | T | . | . | . | . | . | . | . | . | . | . | . |
| SHRUBS | | | | | | | | | | | | | | | | | |
| ALNU INCA | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 6 |
| BETU GLAN | . | . | . | . | . | . | . | 2 | . | . | . | . | . | . | . | . | 4 |
| LONI CAER | . | . | . | . | 1 | 1 | 1 | T | . | 1 | . | 2 | . | . | . | . | . |
| LONI INVO | . | 1 | . | . | 1 | 1 | 1 | 1 | . | 1 | . | . | 3 | 3 | . | 2 | 1 |
| POTE FRUT | . | . | . | . | . | 1 | 1 | . | . | . | . | . | . | . | . | . | 2 |
| RIBE LACU | . | . | 3 | . | 2 | . | . | . | . | 1 | . | 1 | 6 | 1 | . | 4 | . |
| RIBE HUDS | . | . | . | 2 | . | . | . | . | . | . | . | . | 1 | . | . | . | 1 |
| SALX COMM | 6 | 1 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| SALX DRUM | 4 | 5 | 4 | 2 | 5 | 6 | 5 | 2 | 5 | 1 | . | . | 5 | 7 | 5 | 1 | 4 |
| SALX EXIM | . | . | . | . | . | . | 1 | . | T | . | . | . | . | . | . | . | . |
| SALX GEYR | . | 1 | . | . | 4 | . | . | . | . | . | . | . | . | . | . | . | . |
| SALX MONT | . | 5 | . | 5 | . | . | 4 | T | . | . | . | . | . | . | . | . | . |
| SALX MYRT | . | 5 | . | . | 6 | 3 | 5 | 5 | . | . | 8 | 6 | 6 | 2 | 2 | 6 | 3 |
| SALX PHYL | . | . | . | . | . | . | . | . | . | . | . | 2 | . | . | . | . | . |
| SALX WOID | . | . | 6 | . | 1 | 2 | 4 | . | 1 | 6 | T | 5 | . | . | . | . | . |
| GRAMINOIDS | | | | | | | | | | | | | | | | | |
| AGRP CANI | . | . | . | . | 1 | . | . | . | 1 | . | . | . | . | . | 4 | . | . |
| AGRS SCAB | . | . | . | . | . | . | . | . | 1 | . | T | . | . | . | . | . | . |
| BROM CILI | . | . | . | . | T | . | . | 5 | 1 | 4 | T | . | . | T | . | 4 | T |
| CALA CANA | 5 | 3 | 3 | 2 | 4 | 2 | 5 | 5 | 3 | 5 | 7 | 6 | 5 | 6 | 2 | 1 | 4 |
| CARX AQUA | . | T | . | . | . | . | . | 2 | 2 | . | T | . | . | . | . | . | 2 |
| CARX DISP | . | T | . | . | . | . | . | . | . | . | . | . | 5 | . | . | . | . |
| CARX LUZU | . | . | . | . | 1 | . | . | . | . | . | . | . | . | . | . | . | . |
| CARX MICR | . | . | T | T | . | . | . | . | . | . | . | . | . | . | 2 | 1 | T |
| CARX PRAT | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 1 | T | . |
| CARX ROST | . | . | . | . | . | . | . | 2 | 3 | . | 1 | . | . | . | . | 1 | 1 |
| CARX SCOP | 4 | 5 | 2 | . | . | . | . | . | . | 1 | . | . | . | . | . | . | . |
| DESC CESP | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 2 | . | . |
| GLYC STRI | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 1 |
| HORD BRAC | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 1 | . | . |
| JUNC BA/L | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 4 | . |
| LUZU CAMP | . | . | . | . | T | T | . | . | . | . | . | . | . | . | . | . | . |
| LUZU PARV | . | . | T | . | 1 | . | T | . | . | . | . | . | . | . | . | . | . |
| PHLE ALPI | . | . | . | . | . | T | . | . | . | . | . | . | . | . | . | . | T |
| POA LEPT | 1 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| POA PALU | . | . | . | . | . | . | . | . | . | . | T | . | . | . | . | . | T |
| POA PRAT | . | . | . | . | 1 | 1 | . | . | T | . | . | . | . | . | 1 | . | 4 |
| TRIS WOLF | . | . | . | . | T | . | . | . | 1 | 2 | . | . | . | . | 2 | . | . |
| FORBS | | | | | | | | | | | | | | | | | |
| ACHI MILL | 1 | . | 1 | T | T | T | T | . | 1 | 1 | T | . | . | . | 1 | 1 | T |
| ACON COLU | 1 | . | . | . | . | 1 | 1 | 1 | . | 1 | . | T | . | T | . | . | . |
| ANGL ARGU | . | . | . | 1 | . | . | . | . | . | . | . | . | . | 2 | . | . | 1 |
| ARNI CHAM | . | . | . | . | T | . | . | . | . | . | . | . | . | . | 1 | . | 1 |
| ASTE FOLI | 2 | . | . | . | 2 | 2 | 2 | 3 | 2 | 2 | 1 | 2 | . | 2 | 5 | . | 4 |
| ASTE MODE | . | T | . | . | . | T | . | 2 | 1 | T | T | . | . | . | . | . | . |
| CALT BIFL | 1 | . | . | . | . | . | T | . | . | . | . | . | . | . | . | . | . |
| CAST CUSI | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 1 | . | . |
| CAST MINI | . | . | . | . | 4 | . | . | . | . | . | . | . | . | . | . | . | . |
| CIRS IUM | . | . | . | . | . | . | 1 | T | . | . | . | . | . | . | . | . | . |
| DODE JEFF | . | . | . | . | . | . | T | . | . | . | . | . | . | T | . | . | . |
| EPIL ANGU | 1 | . | . | 1 | T | . | . | . | . | 1 | . | . | 2 | 2 | . | . | . |
| EPIL GLAN | 1 | . | . | T | . | . | . | T | . | . | 1 | . | . | . | . | . | . |
| EQUI ARVE | . | 1 | . | . | 1 | 1 | T | T | T | 1 | . | . | . | 1 | T | . | 4 |
| ERIG COUL | . | . | . | . | 1 | . | T | . | . | 2 | . | . | . | . | . | . | 1 |
| FRAG VIRG | . | . | 2 | . | 2 | 2 | . | . | 1 | 2 | . | 1 | . | T | . | 2 | 1 |
| GALI TRFI | 1 | 1 | . | . | . | . | . | 1 | 1 | . | 2 | . | . | T | . | . | . |
| GALI TRFL | . | . | . | 1 | 2 | . | . | . | . | . | . | . | . | T | . | . | . |
| GEUM MACR | . | . | 1 | T | 1 | 1 | . | 2 | 2 | 1 | T | T | 1 | . | . | 1 | 1 |
| LIGU TENU | . | . | . | . | T | T | T | . | . | . | . | 1 | . | . | . | . | . |
| MERT CILI | . | . | 1 | . | . | . | . | . | . | . | . | . | 1 | . | . | T | . |
| MITE PENT | T | . | T | . | . | . | . | . | . | T | T | . | . | . | . | . | T |
| PARN FIMB | . | . | . | . | . | . | T | . | . | . | . | . | . | . | . | . | . |
| PEDI GROE | . | . | . | . | T | 1 | T | . | T | . | . | . | . | . | T | . | . |
| PENS GLOB | . | . | . | . | . | . | . | T | 1 | . | . | T | . | . | 1 | . | . |
| POLE OCCI | 1 | . | . | . | . | 1 | T | 3 | 2 | 1 | 2 | . | . | T | 1 | . | T |
| POLY BIST | T | . | . | . | . | . | . | . | T | . | . | . | . | . | . | . | . |
| POTE GRAC | . | . | . | . | . | . | . | . | 1 | . | . | . | . | . | 2 | . | . |
| SAXI ARGU | . | . | T | 1 | . | . | T | . | . | . | . | . | . | . | . | . | . |
| SAXI OREG | . | . | . | . | . | . | . | T | . | . | . | . | . | . | . | . | . |
| SENE INTE | . | . | . | . | . | . | . | . | . | . | . | . | . | . | T | . | . |
| SENE PSEU | . | . | . | . | . | 1 | T | . | . | 1 | T | . | . | . | . | . | . |
| SENE TRIA | 4 | . | T | . | T | . | 1 | . | T | 2 | T | . | . | T | . | . | . |
| SMIL STEL | . | . | . | . | 2 | 1 | . | T | . | T | . | . | . | . | . | 4 | . |
| SOLI CANA | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 6 | 1 |
| STEL LONG | T | . | . | . | T | . | . | 1 | . | . | T | . | . | . | . | . | . |
| SWER PERE | . | T | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| TARX OFFI | . | . | T | . | T | 1 | . | T | T | . | . | . | . | . | T | . | 1 |
| THAL OCCI | 2 | T | . | . | 1 | 1 | . | 1 | T | 4 | . | . | 4 | 4 | . | 1 | T |
| TRIF LONG | . | . | 1 | . | 1 | . | . | . | . | T | . | . | . | . | T | . | . |
| URTI DIOC | . | . | . | 2 | . | . | . | . | . | . | . | . | 4 | . | . | . | . |
| VERO WORM | . | . | . | . | . | . | . | T | . | . | . | . | . | . | . | . | . |